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VOL. 9, NO. 12

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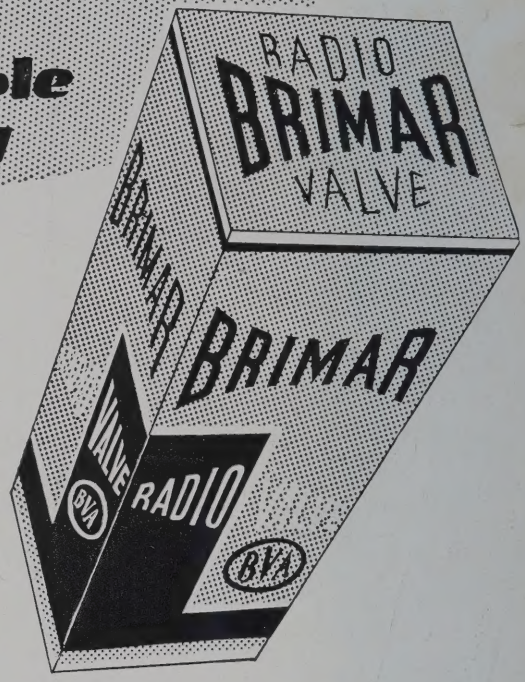

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Radio and Electrical Review

OUR COVER:
Our cover picture this month relates to the Survey of Radio Progress in the Post and Telegraph Department, and shows a mounted quartz crystal being placed in the jig prior to evaporation of silver on to crystal blank.

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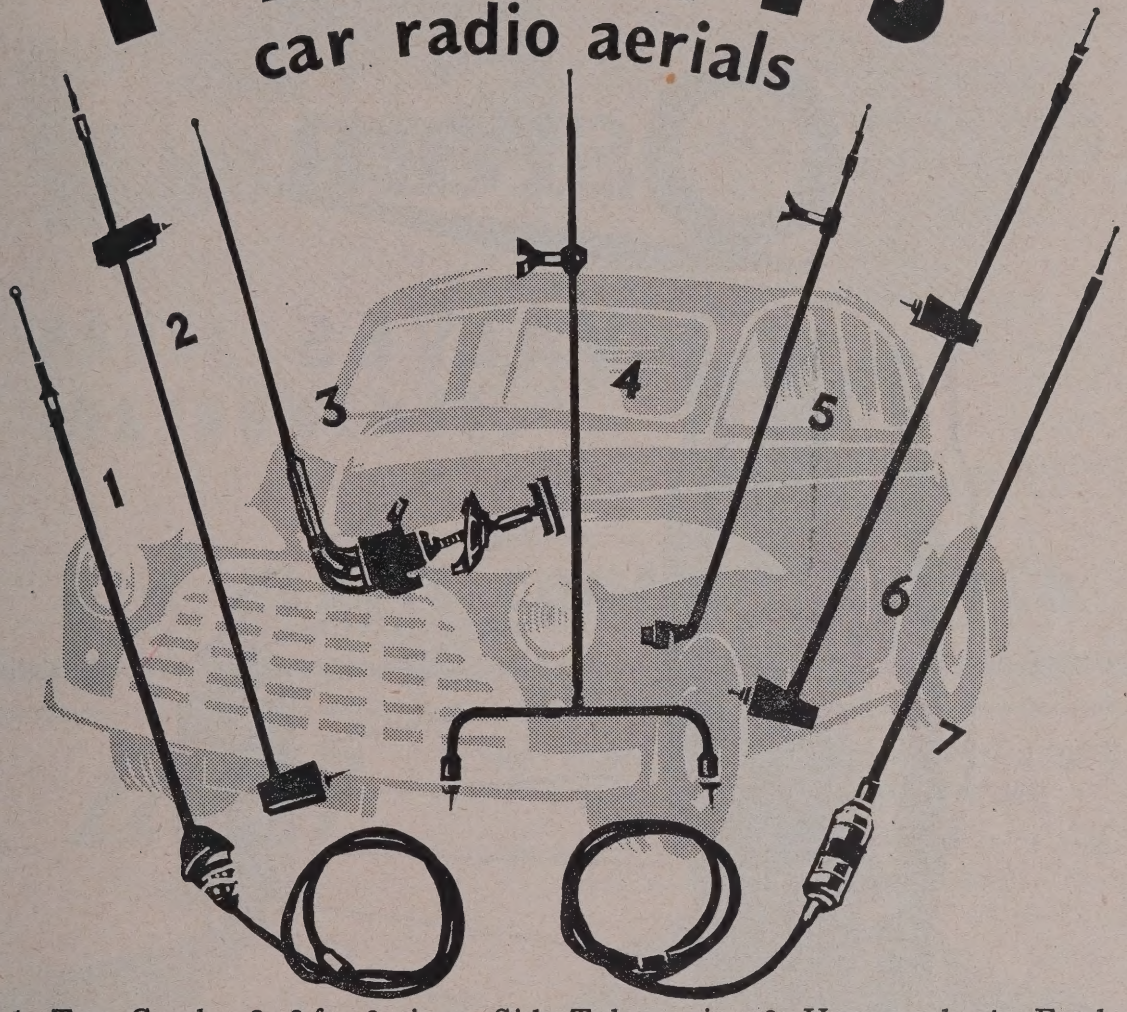

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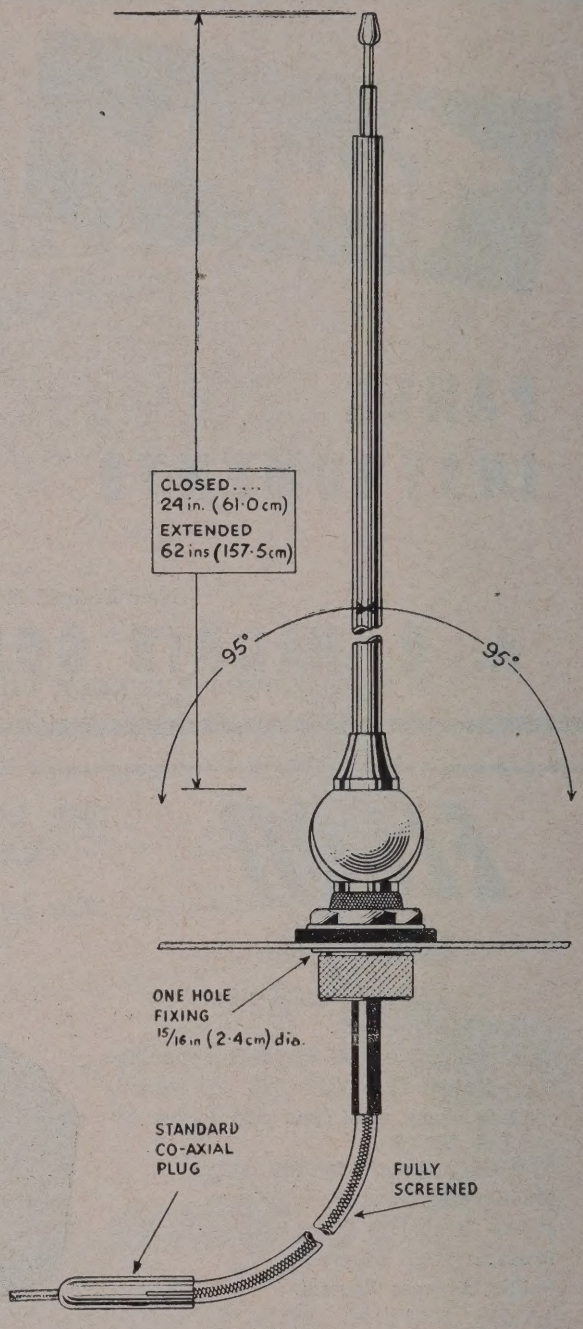

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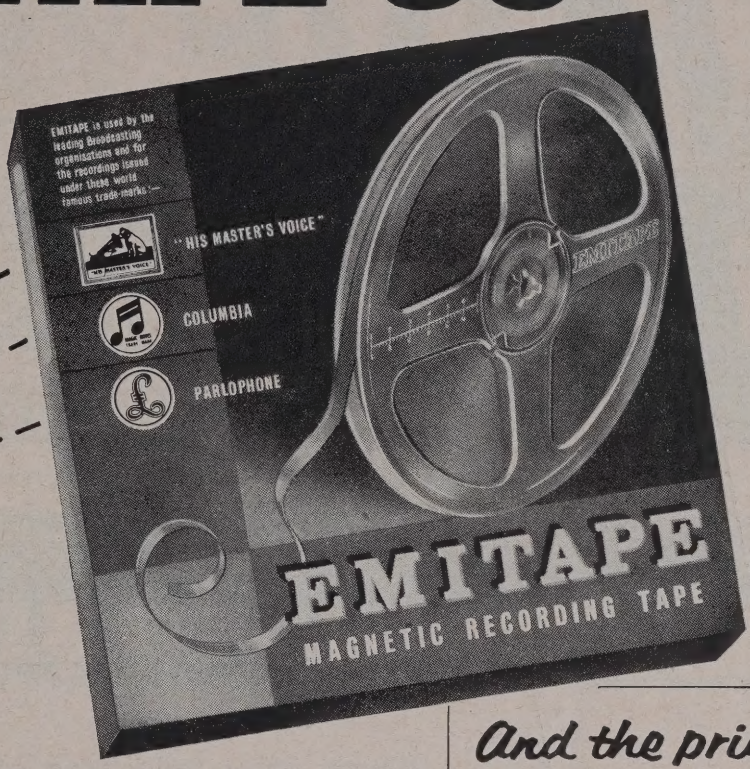

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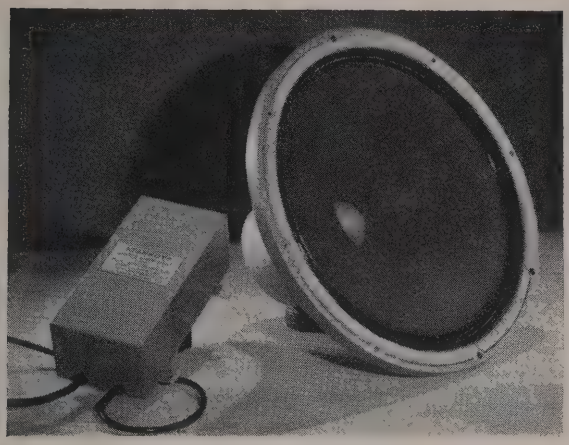

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Oscilloscopes for Television Servicing

It is not often we write editorially on the technical aspects of our subject, but a recent letter from an Australian correspondent revealed a common misconception of the equipment needed for the servicing of television receivers. The question concerned the type of oscilloscope necessary for this work, the correspondent being quite convinced that, for television work, an oscilloscope would require a Y-axis amplifier with a flat response out to 6.5 mc/sec. and a time-base working up to repetition rates of the order of megacycles.

As our correspondent said, published designs for oscilloscopes include amplifiers with a response little wider than the audio frequency range, and, to the uninitiated, it seems only logical that, if one is to deal with television signals in which the modulation frequencies may be as high as 4½ or 5 mc/sec., any amplifiers used in the oscilloscope should have a frequency response of corresponding width. The corollary is that high time-base frequencies must also be necessary, but in point of fact, for all but a very few purposes, amplifiers and time-bases of this sort are just not needed.

The reason for this could not be predicted by those who have not worked with television equipment. It is that, in television receivers, practically all the waveforms to be examined have such a large amplitude that an amplifier is quite unnecessary for displaying them on the C.R.T. screen. Typical oscilloscope tubes have a deflection sensitivity enabling easy examination of waveforms as small in amplitude as ten volts peak-to-peak, while some of the waveforms encountered are of several hundred volts, and yet can still be accommodated on the face of the tube provided they are fed straight to one deflecting plate.

Let us suppose for a moment that we have a Y-amplifier which is flat out to several megacycles per second, and can fill the face of the tube with its undistorted output. Practically all the waveforms in the TV receiver will need not amplification but attenuation, and if they are attenuated before being amplified once more, there is a strong chance that the waveform as shown on the screen will differ in important respects from what one would see if the signal were fed directly to the Y-plate. If this happens, the amplifier is worse than useless, in spite of its frequency response. The main difficulty with television waveforms is that, unlike the sine-waves that are used for testing amplifiers, etc., there is no set shape with which they can be compared. That is to say, we have no means of telling whether what we are seeing has or has not been modified by the 'scope amplifier. Such modification can take place not only through imperfect amplifier response, but also (and more violently) through clipping by an overloaded amplifier. It is the latter effect that is so hard to detect, and very often, if it is suspected, the only way to be sure that the amplifier is not giving a wrong answer is to eliminate it and compare the waveforms with and without its use. In practice, therefore, the amplifier turns out to be a very mixed blessing. Wide-band amplifiers are also difficult to design, are bulky and costly, adding considerably more to the cost and complexity of the oscilloscope than their limited advantages warrant.

Let us examine the situation a little further, and see what could constitute a reasonable amplifier for a television oscilloscope. In the first place, there are only really two frequencies of fundamental importance to a television receiver—the line and frame frequencies. Now, it is well known that, in order to handle pulses and square-waves without visible distortion, an amplifier must have a response extending upwards to include about 20 harmonics of the fundamental frequency of the waveform under examination. In the case of the British system, the line frequency is only 10,125 c/sec., while for the standards adopted in Australia it is 15,625 c/sec. Now, the twentieth harmonics of these frequencies are approximately 200 and 300 kc/sec. respectively, so that a 'scope amplifier with a flat response up to 500 kc/sec., which would not be difficult to build, would be more than adequate for examining all the waveforms in the receiver, with the sole exception of the complete video signal. For the latter, the best way of assessing it is to look at the final result on the screen of the television set, where any shortcomings can easily be detected by their effect on the picture.

As for time-base frequencies, the highest that can possibly be needed is one running at the line frequency, but most often a time-base of one-half or one-third of this frequency will be used, so that two or three complete lines can be viewed on the 'scope.

It thus appears that for television servicing even a very common or garden oscilloscope need not be frowned upon, provided that it has provision for direct connection to the Y-plates. Of course, where work is being done on the design of TV camera or receiving equipment, very refined oscilloscopes with a number of special features are essential, but it will by no means be necessary for the serviceman or the constructor of home-built televisors to possess one of these instruments. Indeed, the writer knows of one synchronizing generator and monoscope camera which were built to conform with the British standards in every respect, and where all the work was done with an oscilloscope which purposely had no Y-amplifier at all. It would have been helpful to have a wide-band electronic switch when carrying out this work, but the same result was achieved by putting signals separately on both Y-plates simultaneously, and simply remembering that one part of the picture was upside down. Let no one complain, therefore, that without £150 or more for a "swept up" commercial 'scope, he cannot undertake television servicing!

An Oscillator for the Audio Experimenter

INTRODUCTION

From the correspondence which we receive from readers, it has been sufficiently obvious for some years that of all the topics which we treat in these pages, audio work is followed by more people than any other. As a result, there are many experimenters, both amateur and professional who have a need for an audio oscillator. This need is all the more apparent when one realizes the quite large number of people who, over the last few years, have built oscilloscopes round the very cheap 5BPI and VCR97 cathode ray tubes that have become available from war surplus sources, and which can still be bought for a mere song. Quite a number of keen amateurs have built 'scopes, only to find that without a source of signals, there is not very much that can be done with it. On the other hand, those possessed of both a 'scope and a good oscillator are able to carry out test, and even design work that would be impossible otherwise. Modern audio apparatus, with its much more complex circuitry, and its much more refined performance than could be obtained not so many years ago, needs better methods of construction and, correspondingly improved methods of performance testing. Indeed, without an oscillator and a scope, it is virtually impossible to be sure that a modern feedback amplifier is functioning without trouble of any sort. Similarly, when building frequency compensation circuits, which are most important in these days of multiple recording characteristics, and comprehensive arrangements for controlling over-all frequency response, an oscillator is almost indispensible. Frequency records are by no means the most satisfactory means for testing flatness of response, or the response of tone control circuits, because they wear out, and because they always need a certain amount of juggling with calculations before the results obtained from them can be properly interpreted.

WHAT SORT OF OSCILLATOR?

Granted, then, that the above little pep-talk has convinced everyone who needed it of the necessity for having an oscillator, the question now arises; what sort is needed? It should obviously fulfill the following requirements, if at all possible.

(1) Frequency Range:

30 c/sec. to 20 kc/sec., at least.

(2) Distortion:

Preferably less than 1 per cent.

(3) Constant output:

This should be constant within 1 db., if possible, over the whole frequency range.

(4) Cost:

The instrument should be as inexpensive as possible, having regard to the performance specification.

(5) Ease of construction:

It should not contain any design features that are difficult to duplicate.

The specification outlined above does not correspond to that of a high-priced commercial instrument. These are usually built to a higher standard, but their cost is prohibitive, and their performance is unnecessarily good for most purposes. On the other hand, if the above recommendations can be achieved in practice, we will finish up with something rather better than the lower-priced commercial equipments in the £30 to £40 class, but at only a fraction of this cost in outlay for components.

In point of fact, our laboratory, in aiming at a specification like the one above, has succeeded in bettering it in some respects, so that the time and money aspect in duplicating it should be amply repaid in performance and usefulness.

FEATURES OF THE OSCILLATOR

Perhaps the best way to show quickly just what the present design provides, would be to list its actual features.

(1) Frequency range:

It covers from below 10 c/sec. to 50 kc./sec. This wide range, which is obtained in three bands, will be found particularly useful by those who are dealing with feedback amplifiers, for these need to be tested at frequencies much lower, and much higher than the audio range.

(2) Distortion:

By limiting the output voltage to a small fraction of the maximum possible, the valves in the oscillator are made to work very lightly, over a portion of their characteristic that is almost straight. This ensures that distortion is low, and experience leads us to believe that it is sensibly less than one per cent.

(3) Output:

The output is variable, with a simple wire-wound potentiometer as the control, but at any setting of this control, tuning the oscillator over its range produces less than 1 db. change in the output. This is a most valuable feature, because it enables frequency response to be gauged without having to re-set the output level every time a reading is to be taken.

(4) Cost:

The circuit uses only three double triodes, 6SN7s, and a 6X5 rectifier in the built-in power supply. Built with the power supply inside, as in the prototype, the parts should not cost more than £10, as the chassis work can easily be made by the constructor himself from aluminium sheet and expanded aluminium. Even with a commercially built chassis it is

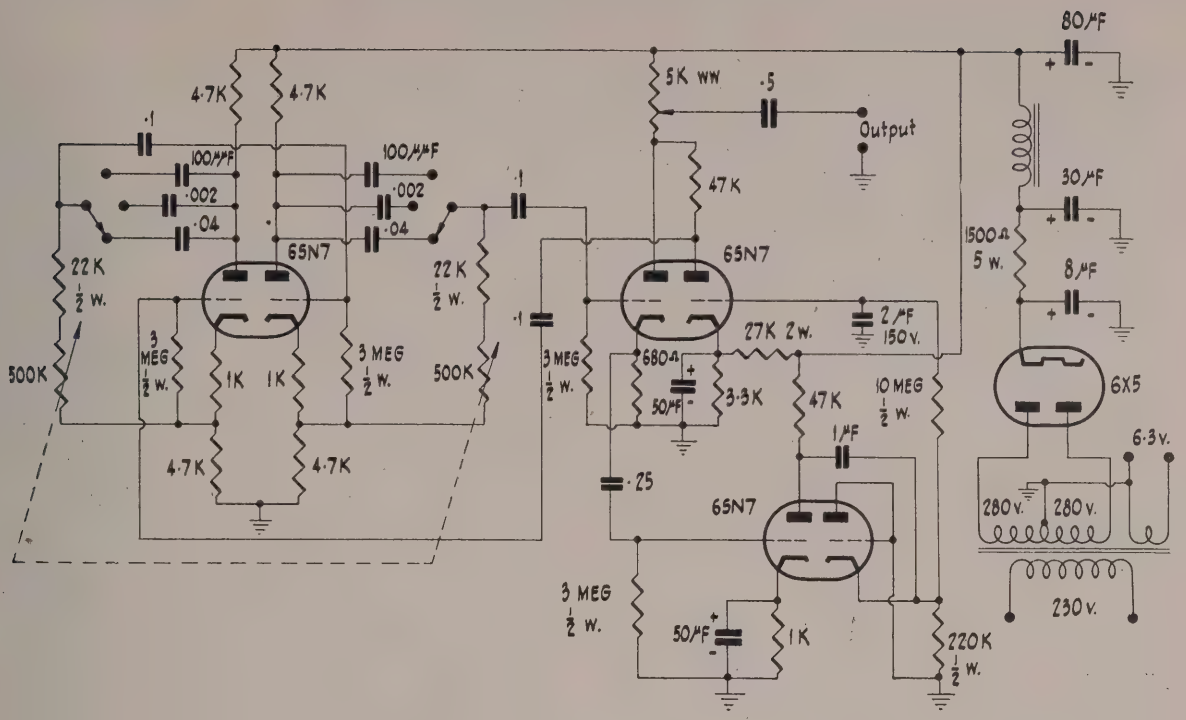


Fig. 2.—Circuit of the complete oscillator.

doubtful whether the £10 mark would be exceeded.

(5) Ease of construction:

The circuit is essentially a simple one, and constructors should find little difficulty in reproducing its performance. Instead of using variable condensers, ganged potentiometers are used for varying the frequency, and this makes it possible to build the oscillator more compactly and less expensively. It also has the great advantage of enabling a much greater frequency sweep to be obtained on each range, and to some extent, this has been taken advantage of in providing quite generous overlap between ranges, while the total range of 8½ c/sec. to 50 kc/s. in three steps, is considerably more than could have been done with variable condensers. Construction itself is very straightforward, both mechanically and electrically, and need not cause any difficulty at all to anyone who has built an audio amplifier successfully. Needless to say, all the parts must be rigidly mounted if the oscillator is to hold its frequency calibration, but this is purely a matter of careful construction.

THE CIRCUIT IN DETAIL

Basically, the circuit is that of the ordinary phase-shift oscillator, modified to make it rather more suitable for the present purpose than it is in its usual form. The fundamental circuit is shown in Fig. 1, and while the complete circuit does not seem to resemble this arrangement in the slightest, it is arrived at by a simple process of evolution.

It is not difficult to obtain a physical picture of the way in which the oscillator of Fig. 1 works.

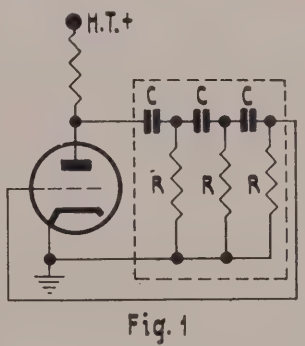


Fig. 1

Fig 1.

It is nothing but a single-stage amplifier, the output of which is fed back to the input through the network of condensers and resistors. Now any arrangement of this sort will oscillate provided two simple conditions are satisfied. First, the gain in the amplifier valve must be greater than the loss (if any) in the coupling network between output and input. In the particular circuit illustrated, there is an attenuation of 29 times (at the oscillation frequency) in the CR network, so that the first condition is that the valve must have a gain of 29 times or better. With modern tubes, this is easily satisfied, single-stage gains much greater than this being easily obtainable.

The second condition is that at the oscillation frequency there must be a phase change of 180 degrees, so that the feed-back voltage is in phase with any voltage which may appear at the grid.

Now a CR network like this one will produce phase shift at all frequencies, but the condition just stated tells us that the frequency of oscillation will be that at which the phase shift is 180 degrees, if there is a frequency at which such a phase shift occurs. Now a single CR combination can theoretically give a maximum phase shift of 90 degrees, but this is obtained only when the circuit values are such that the output from the combination is zero. Thus it is not difficult to see that a minimum of three CR combinations must be used, if a total of 180 degrees shift is to be obtained, and some output as well! Furthermore, it is in the nature of such networks that the phase shift can have only one value at one particular frequency, and also that no two frequencies can have the same phase shift. Thus, there is only one frequency at which a given phase shift occurs, if we have fixed the values of all the Cs and Rs beforehand. This is the reason why the circuit will oscillate at only one frequency. However, the oscillation frequency can easily be varied by changing the value of one or more of the components. It two components are varied simultaneously, we will clearly obtain a greater variation in frequency than when we vary only one, and if three are varied at once, there will be an even greater frequency range. If in addition we switch the values of the other three components a very wide range indeed can be covered. Usually, the condensers are made variable, because they are obtainable already ganged in threes or even fours, but the circuit of Fig. 1 obviously does not lend itself to the use of ganged condensers, since there is no point on the circuit that is common to all three condensers, as the frame of an ordinary gang. However, this does not matter very much, because we do not propose to use the circuit of Fig. 1 in that form. One of the difficulties about the circuit is that with variable condensers it cannot easily be made to give a frequency range of more than ten to one, so that if we want to cover a wide range, it would have to be broken up into several steps, each with its own dial scale. The point at issue is, what can be done about it? Well, by making use of a quite well-known phase-shifting circuit instead of the simple CR sections, quite a lot can be done. This circuit is given in Fig. 2. It is nothing more than the common-or-garden split-load phase inverter circuit, using a triode valve, which feeds a CR network, which is connected to the two output terminals of the phase inverter. The valve deputises for a transformer with a centre-tapped secondary, which has the CR network connected across the whole secondary. Indeed, if it were not for certain limitations, it would be possible to use a transformer instead of the valve. It is a property of this particular arrangement that it can give a phase shift of from about 30 degrees to 150 degrees with no change in output, and with very little attenuation. It is therefore ideal for use in a phase-shift oscillator instead of the simple CR circuit. Now one such circuit cannot by itself give the 180 degrees needed for the oscillator, but two can do it easily, so that we can now modify Fig. 1 by chopping out the last CR, and replacing the other two each by the circuit in Fig. 2. We then have an oscillator which requires a gain in the amplifier valve of only about 2½ times (instead of 29 times as before) and which also can be made to cover a much wider frequency range, especially if the Rs are made variable rather than the Cs. One reason for this is that a variable resistor can be made to give almost as large a ratio of maximum to minimum resistance as we please, and the other is that the new phase shifting circuit works over much wider ranges than does the simple CR circuit. Between the two, this arrangement can be made quite easily to give a frequency range of 30 to 1, so that two ranges could give 900 to 1. This means that in two ranges we could cover all frequencies from 20 c/sec. to 18,000 c/sec.! In practice, we have not done this, for a number of reasons that we haven't time to go into at the moment, but instead have settled for a useful sweep of some 20 to 1, and three ranges.

In the main circuit, the left-hand double triode, a 6SN7, provides the two phase shifters. The left-hand half of the right-hand upper 6SN7 is the amplifier valve, whose output feeds the first phase shifter, and whose grid is fed by the second. The remaining one-and-a-half 6SN7s are concerned solely with automatic gain control, whose purpose is to see that the circuit does not oscillate hard, but only weakly, and therefore with good waveform. The control takes the form of a variable voltage divider. The upper leg of this, is the 47k resistor which is attached to the plate of the amplifier triode, and the lower leg is the other triode in the same envelope. One half of the lower 6SN7 is fed with signal from the cathode of the amplifier valve, and its output feeds the amplified signal to the other half, which is used as a diode. The polarity of the latter is such as to give a positive rectified output voltage, and this is applied through a CR filter to the grid of the control tube. The operation of the AGC system is as follows. Should the amplitude of oscillation increase for any reason, more rectified positive voltage is applied to the control tube. This lowers its effective resistance, so that less signal voltage appears at its plate, and thus less feedback is provided in the oscillator circuit. This in its turn reduces the amplitude of oscillation. Should the amplitude attempt to drop, the sequence of control is exactly the opposite. The arrangement is very effective, and it is this which manages to hold the amplitude constant within 1 db. over the whole range of the oscillator.

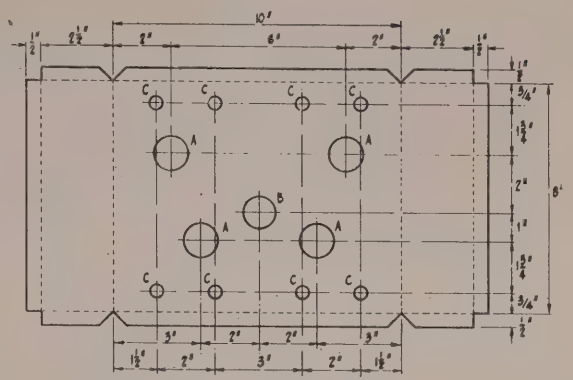
The remaining part of the circuit is the power supply, using a 280 volts-a-side transformer and a 6X5 rectifier. The important thing to note about this is the large amount of smoothing that has been indulged in. Unfortunately, this was found essential, because of the following effect. As everyone knows, the hum voltage from a full-wave rectifier has a fundamental frequency of 100 c/sec; in addition, there are harmonics of this frequency present also. What happens in an audio oscillator, whose power supply is not hum-free, is that at 100 c/sec. and its multiples, the oscillator output beats with the hum components, and causes the output to swing up and down violently when the dial is set almost exactly to any of these frequencies. To avoid this annoying type of behaviour, it is necessary to use much more than the normal amount of smoothing. It is for this reason that a two-stage filter has been used, with very large smoothing condensers. The last one, of 80 μf., is obtained by means of a dual 40 μf. condenser, with the two sections connected in parallel. The smoothing choke is a 50 ma. one, as the total H.T. drain of the circuit is approximately 35 ma. at 250 volts. The exact H.T. voltage is not critical, but to obtain 250 volts with a resistance filter for the first

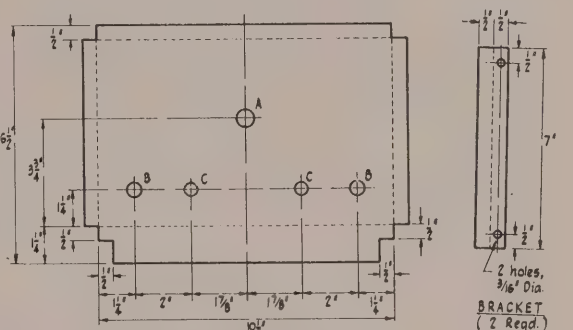
stage, a 280 volt-a-side transformer is needed. If anyone has two 50 ma. chokes that can be used, they would be well advised to use both of them, one going into the circuit in place of the 1500 ohm smoothing resistor. If this is done, it will be necessary to change the transformer for one with a smaller voltage output. About 240 or 250 volts-a-side should fill the bill.

The components are all standard radio ones, and apart from the ganged potentiometer, need cause no difficulty. If possible, the pairs of condensers in the phase shift circuit should be matched, but if matched pairs cannot be obtained, it will not matter very much, because each range will be individually calibrated in any case, and any output variation over the bands that may be caused by not having the condensers matched will be easily compensated for by the AGC circuit. With regard to the latter, it is advisable if possible to have the 2 μf. condenser used at the grid control tube checked for leakage, because a leaky condenser here might give rise to a kind of instability in which the oscillator output swings up and down in a regular fashion, and refuses to remain steady. This swinging up and down will be noticed whenever the frequency dial is shifted, and is caused by the AGC circuit. When the dial is moved, there is a sudden change in oscillation amplitude, but owing to the very long time-constant in the filter between the control rectifier and the control tube, the AGC cannot come into action immediately. Thus, after the dial is stopped at its new setting, the output will swing up and down for a few seconds before settling down to its proper amplitude. This behaviour is quite normal for the circuit, and does not indicate a fault, unless the amplitude refuses to settle. This swinging of the output level is the only real disadvantage of the circuit. It is unfortunately inherent in the type of automatic gain control we have used, and prevents the oscillator from being used as a "sweeping" one. That is to say, one cannot slowly sweep the dial over the frequency range without changes in amplitude making themselves felt. However, for the purposes to which the oscillator will be put, the disadvantage is not a very important one, as most often, it will be desirable to set the frequency to known values, and then read the output of the amplifier under test at each one, in order to draw a graph of the frequency response.

GANGED POTENTIOMETERS

In the prototype, as the photographs show, a commercial ganged potentiometer was used. These are a little difficult to come by, but not impossible, as used to be the case in this country. We have mentioned this before, but it is worth noting again that at least one importer of potentiometers is carrying a small stock of special potentiometers, and is willing to order any from overseas should they not be in stock. Those who intend to build the oscillator can therefore place an order with their parts dealer, and get on with the construction pending the arrival of the potentiometer. An alternative would be to couple up a pair of ordinary 0.5 Meg. volume control potentiometers. This can be done with Meccano gears, or gearing salvaged from a war-surplus gear train. If it is intended to do things this way, it would be better, although not essential, to move the main dial over to the left a little, so that the pair of potentiometers can be mounted side by side





in the middle of the panel, thus making the leads to the rest of the circuit as short as possible. However, much the easier job is to order a dual pot. and wait for it to arrive, should it have to be specially indented!

CALIBRATION

One of the main difficulties confronting the builder of an instrument like this one is that of calibrating the frequency dial, once it is completed. Even with the equipment to do it, this is quite a job, though not a difficult one. Accordingly, we will leave the description of this for a further article in an early issue of the "R and E."

CONSTRUCTION

Complete detailed drawings of the chassis-work are given in the accompanying diagrams, and should need little amplification. The idea of using an expanded aluminium cover for the top, sides, and bottom makes for ease of construction, and at the same time allows the heat from the valves to escape easily. This makes all the difference to the life of the small parts, as the instrument runs much cooler than one of more conventional construction, owing to the excellent air circulation, which is enhanced by placing a few holes in the chassis at strategic places.

(To be concluded).

Television Development in Britain

By FRED COOKE

Television Correspondent of "Reynolds News," London, and author of "Everybody's Guide to Television"

According to newspaper critics, despairing of much of what they see on their screens, television in Britain is nearly always down. But it is never, never, out.

There is, however, placid calm in the hierarchy of the British Broadcasting Corporation expressed particularly in the Irish charm of television programmes chief Cecil McGivern, which indicates that the broadsides of the critics leave him quite unmoved.

After all, why should the administrators of Britain's nationalized entertainment industry show concern for the fulminations of the critics when, by the mere flick of a file, they have all the evidence they want that they really are doing a good job of work?

For that comfort, the B.B.C. turns to its own success-failure barometer. It goes by the name of Audience Research, a machine employing a panel of volunteers as well as salaried workers throughout Britain perpetually conducting an assessment of programme reaction.

This is an important guide to the B.B.C. in carrying out its job, as also are the letters it receives from the general public. It does, however, also take notice of constructive press criticism.

There's a lot to be said for giving the public what it wants. It's nice and democratic. But television is still a very new medium with thousands of converts from the ranks of "steam radio" each week. Until they become accustomed to the miracle of live pictures in their own parlours, these people are little concerned with programme quality. They comprise a vast field of viewing inexperience making its impact on Audience Research analysis.

£3 A Year

Head of television light entertainment, Ronnie Waldman, is the most press-criticised top-boy in television. His department is undoubtedly the most vulnerable. But my sympathies are all with Ronnie.

Because he has to struggle on the tightest purse strings his is the toughest job in the whole of show business.

The television service like the B.B.C. sound services, is paid for out of the total income derived from licence fees, At present the television licence is £3 a year and there are some three and a half million television sets in Britain, but the television service is able to draw to some extent on the general income which comes from sound licences. The Corporation's revenue from licences may look substantial in the bulk; it is reckoned that it was some £17,000,000 in the year 1953-54. However, a very wide field of both sound and television programmes has to be covered, and capital expenditure in the growing television service is necessarily a heavy charge.

The B.B.C. is every year improving its television equipment and erecting new transmitters to give a complete coverage of the United Kingdom. A new television centre is being built.

Nine of Europe's top TV "speakerines" rehearsing at Limegrove for their appearance in "Cafe Continental" TV Eurovision Programme.

Waldman's biggest headache is the reluctance of the big names of show business to play ball with television. Men like Arthur Askey, Terry Thomas, Frankie Howerd, Norman Wisdom, are quite honest about their attitude to television. They chorus, in effect, "The rewards are too small and the risks too great. One bad performance and your reputation is blasted before an audience of several millions.

Need for Scriptwriters

They have many more arguments for a fighting-shy attitude. The material with which a top-class comedian can tour the music halls of Britain for a year is wiped out in one fell swoop by one television appearance. Television is a great devourer of material —and Britain just hasn't enough scriptwriters to keep the stars fed with original material for more than just an occasional television appearance.

The stars have not abandoned television altogether. After all, no matter how poor the pay, the publicity boost of an occasional appearance before the biggest audience in the world is not to be sniffed at. When an artist has been out of the national limelight for a while, one television appearance brings him, or her, back with a bang! On his recent return from a two year tour of Australia and New Zealand, Tommy Trinder made a welcome television appearance in "Variety Parade."

In almost every other field, television in Britain comes out with flying colours. Throughout the summer months great events like the Test Matches and Wimbledon dominate hours of viewing time; summer and winter, a fleet of mobile units brings the big outdoor events—anything from the crowning of a beauty queen to a county cricket match or the pageantry of a great state occasion to the simplicity of a village fete, is brought to the homes of millions.

35,000,000 Licences

All these visual delights, brought to the hearths of the nation, are the greatest single contribution to the rapid pace at which the eager newcomer, television, is outstripping sound radio.

While sound licences go into decline, television licences have increased from 92,000 in 1948 to this year's total of three and a half million.

Annette Mills with Muffin the Mule.

The statisticians (Audience Research again) have worked out that there are three and a half viewers per licensed set, giving a total viewing audience of ten million—the average for any one programme being four and a half million or 40 per cent. of the nation's television sets switched on per programme.

Drama stands high in the affection of viewers in Britain, especially now that Michael Barry has taken over with a greater understanding of what the public wants in the matter of play fare. Barry, now head of the B.B.C's. television drama, has combined a long experience of producing for television with directing films. He first joined the B.B.C. in 1938 and served with the Royal Marines during World War II. For a time he was directing films for Independent Producers, then returned again to the B.B.C.

Reconciling all Tastes

Striving all the time to reconcile all tastes within the limitations of one wave-band, television has, of necessity, to develop the more cultured themes at the expense of the lighter touch. Shakespeare, with a magnificence in set design and costuming not excelled outside the Old Vic or the Stratford Memorial Theatre, is among the finest things television has done.

Opera and ballet are presented in such a way that millions who once regarded these as high falutin' art forms have been surprised at their sheer entertainment value, as viewed from the small screen.

Television documentary programmes, lavishly aided by films and animated drawings, have created a nation-wide interest in the problems of the day—the H-Bomb; East v. West ideologies: McCarthyism; while talented commentators have provided a penetrating insight into subjects as diverse as "other men's religions" and Iron Curtain enigmas.

Whatever the critics say about B.B.C. shortcomings, there is no doubt that the overall picture is one of considerable achievement. And criticism wears a shabby look alongside the latest B.B.C. triumph—the great experiment in international television known as Eurovision. This imaginative conception, linking eight European nations in a vast mutual audience for the appreciation of each other's programmes, was sparked by British genius both in the programme production and on the technical side.

Commercial Television

In a gesture of international goodwill the B.B.C. gave unstintingly of its manpower and experience to the international pool.

When weighing up the arguments for and against commercial television, now challenging the B.B.C. monopoly, one has to consider how commercial television would have shaped up to a project like the eight-nation exchange—a project of high sociological purport and with no foreseeable cash rewards.

Meantime, on the home front, there are signs that the challenge of sponsored vision is making its impact in the Broadcasting House citadel.

Some of the rivalries between sound and vision which have prevented both of them getting the best of each other's world, are being dissipated by the new threat and the televising of the old sound favourite "In Town Tonight" is a welcome sign of unity.

Whether commercial television is going to be a good thing or not, there is at least this to be entered on its credit side—there is a new spirit of alertness in the places where B.B.C. planners meet. And Britain's tele-view looks much brighter.

For the Amateur

SOME HINTS ON NEUTRALIZATION

In these days when beam tetrodes or pentodes are used so much more than triodes in the R.F. power amplifier stages of transmitters, the business of neutralization tends to be forgotten, sometimes with disastrous results, and much consequent grief to the builder of a new transmitter. Indeed, many newcomers to the "ham" fraternity have never neutralized an R.F. amplifier, and have mentally relegated the process to the limbo whence spark transmitters and electrolytic detectors have long since departed. Now this is a great pity, for a variety of reasons. In the first place, the modern high-gain pentode or beam tube does not entirely do away with the need for neutralization. The makers of the valves do not claim this for them, and in some cases go to considerable lengths to point out the precautions to be taken in order to avoid the necessity. Moreover, we are all human, and the natural impulse to do without such precautions, on the score that the frequency is low, and so neutralization can't possibly be necessary, O.M., is very strong. However, the failure to take such precautions very often results in R.F. amplifiers which behave in a peculiar fashion. They are unstable when lightly loaded, for example, but we get away with this, because after all the stage is fully loaded when it is in use, and that oscillation won't show up then. Or will it? One day we get a rude shock when the fellow at the other end tells us that our signal is by no means clear, or that it seems spread out over quite a slice of the band. We know this can't be true, because we are crystal-controlled, and so we express disbelief. But there it is. If we only knew it, that oscillation we thought wasn't there when the load was on it, is there all the time, and it isn't on quite the same frequency as the crystal-contolled signal, by any means; nor does it key as nicely, thus accounting for the poor reports on our note.

Or again, the oscillation might not be there at all, as we had hoped. But one day, we build that long-promised modulator, and the fun really starts. We have taken quite a bit of trouble with that modulator. Its waveform on the 'scope, with a sine-wave signal, looks first-class. Nothing wrong there, so when ZL2XYZ across town tells us as politely as possible that our 'phone doesn't sound too healthy, we write him off as needing some maintenance done on that old receiver of his. But we are wrong again. It's that oscillation again, or even if it isn't it's the result of having regeneration in the modulated amplifier. And the answer? It shouldn't be necessary to say it by now—neutralization!

NEUTRALIZING PENTODES AND BEAM-TUBES

One of the difficulties about neutralizing these tubes is that their grid-plate capacity is so small. In an ideal pentode, of course, it would be zero, and unless the feedback causing oscillation was caused by poor physical lay-out, there could be no oscillation. As it is, the grid-plate capacity is only a small fraction of a pf., and when it comes to practical neutralizing circuits, this is the trouble. In short, it's easier to neutralize a triode, if you have to do any neutralization, than it is a pentode. At this point one might well ask, why not use a triode in the first place? but the answer is quite a simple one. It is simply that the pentode takes almost no power to drive it. Of course, the trickiness of pentodes and tetrodes is the price we pay for their tremendous power gain, and consequently minute driving power, so, as usual, we don't get anything for nothing.

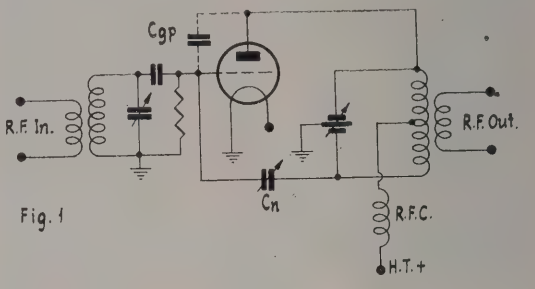


Fig. 1

The most popular circuit for neutralizing a triode amplifier is the plate-neutralized circuit shown in Fig. 1. Here, the plate tank is split into two equal parts, so that the R.F. voltages at the ends are equal, and exactly out of phase. This being so, we can neutralize the stage, or, to express it differently, prevent any feedback of R.F. voltage from the plate to the control grid by the simple expedient of connecting a small condenser from the grid to the end of the tank opposite to the plate. If now we adjust C_n to be exactly equal to C_{gp}, the desired condition will obtain. This is why, if we use this circuit, it is extremely inconvenient when the tube is a pentode, whose grid-plate capacity is only, say, 0.1 $\mu\mu$f. How can we obtain such a small neutralizing condenser, let alone have it adjustable? The usual trick is to make the "condenser" a small piece of stiff wire, placed an inch or so from the valve, when its capacity to the plate will have the required value. (Incidentally, this can only be done at all readily in push-pull circuits, where the wires are directly connected to the grids of the valves, and are crossed over before going through the chassis to be placed near the opposite valve's plate.)

One way out of the difficulty is shown in Fig. 2. Here, we have still used a split-stator tuning condenser, so that the plate circuit is a balanced one, and instead of connecting the neutralizing condenser to the opposite end of the tank coil, we tap it down quite near to the centre of the coil, making sure to keep it on the same side of the centre as for the conventional neutralizing circuit. Suppose we tap the tank so that the number of turns between the centre and the tap is one-quarter of the total number of turns in one-half of the coil. We will then have approximately a quarter of the R.F. voltage at the tap that there is at the end of the coil, so that for neutralization we would need four times the capacity in the neutralizing condenser. In the case quoted, this would still be only 0.4 $\mu\mu$f., but even this looks more like a practical figure. By taking the tap farther still

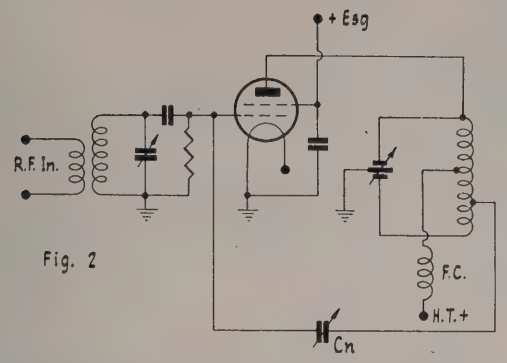


Fig. 2

towards the centre, the neutralizing condenser will need to be proportionately bigger, and we can usually arrive at a figure of between 1 and 2 $\mu\mu$f.

Now, a variable condenser of this size can easily be made from two small discs, one fixed, and the other movable by being mounted on a threaded rod, so that there should now be no real difficulty in neutralizing the stage by the usual methods of adjustment. Our main trouble now is that we have probably built the circuit in the first place without a split-stator condenser and centre-tapped coil, and making a change might not even be possible without rebuilding the stage altogether. Fortunately, however, there is a way out of this dilemma. We don't use a split-stator circuit at all. Instead, we wind a turn or two over the "cold" end of the coil (the end to which the H.T. is connected) and use that instead. If the extra winding is put on in the same direction as the tank coil, the best way is to space it a little from the end, and join the inside end of the extra coil to the cold end of the tank. The free end is then connected to the neutralizing condenser. If the winding must go over the top of the existing tank coil, wind it in the opposite direction from the latter, and then connect the outside end to the end of the tank winding, feeding the neutralizing condenser from the inside end. These precautions are to ensure that the phasing of the R.F. voltage is correct. Otherwise, we will be introducing positive feedback instead of negative, and making things worse instead of better. Having done this, we are not out of the wood yet, because the system has yet to be properly adjusted.

ADJUSTMENT OF NEUTRALIZATION

The remarks which follow apply to any system of neutralization, and to any type of tube. With pentodes or tetrodes, however, they are more critical, and so must be done more carefully if the outcome is to be successful. Besides, we have yet another blow in store for the unfortunate with the 807 that won't sit down. Even after going through the procedures about to be outlined, he may find it impossible to stabilize his amplifier. If this is so, the most likely explanation is that he is troubled with **over-neutralization** even before any neutralization is attempted, with the result that the ordinary neutralizing arrangement only makes matters worse! However, there is a cure, even for this plight, so we will proceed.

The earliest, and least sensitive, method of adjusting neutralizing condensers was to take an absorption wave-meter, and, with the H.T. to the stage removed but with excitation applied, the plate tank circuit was explored for the presence of R.F. This is done by first tuning the absorption wave-meter to the operating frequency, coupling it to the plate tank, and then tuning the latter. If R.F. is present, it shows on the wave-meter. This method is O.K. for high-powered stages, in which tens of watts of driving power are needed, but for low-powered stages, and especially those using pentodes or tetrodes, it is almost if not quite unusable. Even where it can be used, it gives only a rough indication of the correct setting of the neutralizing condenser. The method is simply to adjust the latter, with the tank circuit tuned to resonance, until all signs of R.F. in the wave-meter disappear.

The next method is quite sensitive. A meter is connected to measure the grid current of the stage to be neutralized, and excitation is applied, with the H.T. voltage removed. The plate tank is then carefully tuned through resonance. In an unneutralized stage (whether over or under-neutralized), this causes a movement of the grid current meter, as the plate tank is tuned through resonance. The neutralizing condenser is then adjusted, and the same motions gone through again. If the movement of the grid current meter is reduced, the adjustment was towards the right direction, and vice versa. The neutralizing condenser is then adjusted for minimum flick of the grid meter as the plate circuit is tuned through the signal. This method is quite sensitive, and for most purposes is quite accurate enough. However, there is a better method, which is not generally known except by broadcast engineers, who use it because it can be done while the stage is working at full power output. It

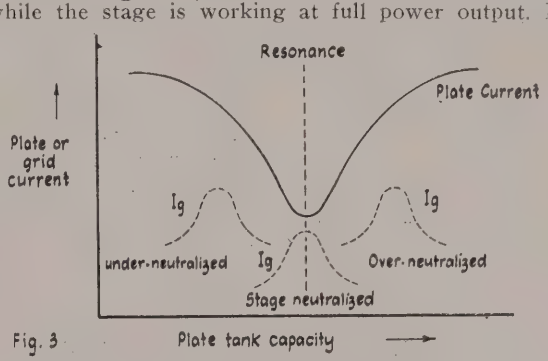


Fig. 3

therefore results in the best possible neutralization, the reason being that there is a slight difference between the effective valve capacities under actual working conditions, as compared with those that obtain when, say, the plate voltage is not applied.

THE "NEW" METHOD

In order to carry out the method to be described, it is necessary only to have two meters in circuit simultaneously—one measuring D.C. plate current, and the other measuring D.C. grid current. Thus, those stages which have provision only for one meter to be in circuit at one time will need to be temporarily modified accordingly. The graph (Fig. 1) tells the story of the method rather better than a large amount of description can do; the full curve shows how the plate current varies as the plate tank circuit is tuned through resonance. It shows the familiar dip in plate current at resonance. For purposes of illustration, this dip has been shown quite deep, but, of course, it will not be as deep as this in practice when the stage is fully loaded. For a first attempt at using the unfamiliar method, it might be as well to reduce the

Continued on page 31).

The PHILIPS Experimenter

No. 88: PHILIPS TRANSISTORS (PART 3)

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At the end of the last instalment of this series, we described briefly the three basic ways of connecting transistors, and showed how these resemble the corresponding ways of connecting vacuum tubes. So far, no mention has been made of an additional property, which is peculiar to point transistors, and which enables circuits to be designed which have no real counterparts in valve circuitry.

NEGATIVE RESISTANCE

As mentioned above, there is nothing quite like the circuits which come under the above heading. As we shall see in a moment, it is only point-contact transistors which exhibit the phenomenon of negative resistance, and this fact places them in a class of their own for certain types of work—especially in the domain of pulse circuitry, as is used in television and radar—where their use enables exceedingly complex electronic functions to be carried out with the smallest equipment and with the lowest power consumption yet achieved. For electronic computors, point-contact transistors seem to be out on their own, and its seems that their use will continue in the fields just mentioned for some years to come, in spite of the limitations we have already mentioned.

First of all, what is negative resistance? Those who have read about the dynatron and transitron will already have some idea, but for the benefit of those who have not, we had better explain as briefly as possible. An ordinary resistance is something which absorbs electrical energy when a current is passed through it. It obeys Ohm's Law, which is to say that if we draw a graph showing how the current in it varies, for different voltages impressed across it, the "curve" will be a straight line, whose slope on the graph tells us the "value" of the the resistance. This is illustrated in Fig. 1, where we have drawn the appropriate straight lines which represent resistors of 1000 and 2000 ohms. Now the next step is to look at a device (and there are many of them) which has resistance, but which does not obey Ohm's Law. Such a thing is an ordinary tungsten-filament lamp, whose resistance is dependent on temperature. Thus, when cold it has a certain resistance. If now some current is passed through it, it warms up, and its resistance increases, and its curve is like (a) in Fig. 2. which shows clearly that the resistance of the lamp is not constant, but depends on how much current is flowing through it. At any particular value of current ,the resistance is equal to the slope of the straight line which is drawn tangent to the curve at that point. Other non-ohmic resistors are NTC resistors, which have already been described in these pages. These have a curve which bends the other way, showing that as the current increases, the resistance decreases. Now let us take an imaginary device, whose curve slopes the same way as that of an NTC resistor, but which finally curls over and turns downward again. At the top of the curve, a tangent, if it were drawn, would be parallel to the I axis, and this would mean that at this point, a small increase in current would cause no additional voltage drop across the resistor. In other words, at this point (but at this point only), the resistance to variations in current is zero. An engineer would say the same thing by saying that the **incremental** resistance is zero. It is important to get this quite straight in our minds, because saying this is NOT the same thing as saying that the absolute resistance is zero, or simply that the resistance is zero. The latter would mean that however small the voltage across it, the current would be infinitely great! Now what about the part of the curve that turns back after the point of zero (incremental) resistance? Here, if the curve is to be believed, an increase in current causes a reduction in the voltage drop across the resistor, and this is exactly the opposite behaviour to that of an ordinary resistor. One which behaves in this peculiar manner is said to exhibit **negative resistance.** Instead of absorbing power, a negative resistance actually supplies it, and thus, if we have a device which exhibits negative resistance, it can be made into an oscillator. Here at last we have come back to the practical side of things, for the point-contact transistor, under certain conditions has a negative input resistance. When this is so, a tuned circuit with the correct impedance at resonance can be connected to the input terminals, and the result is an oscillator.

NEGATIVE RESISTANCE CIRCUITS

A typical example of negative resistance circuits has already been given in the first part of this article, where we showed the circuit of a free-running multivibrator. It is just as easy, by choosing the correct load resistance, and the operating voltages, to make a mono-stable multivibrator (or flip-flop), or a bi-stable trigger circuit, and all of these arrangements find wide application in electronic computors and similar equipment. But of most interest to the average radio man, perhaps, is the ease with which ordinary sinusoidal oscillators can be made by using this property. The transmitter circuit used by Pottinger for his record-breaking QSOs was one of these negative resistance ones. First of all, let us get a physical picture of how a transistor is made to have a negative input resistance.

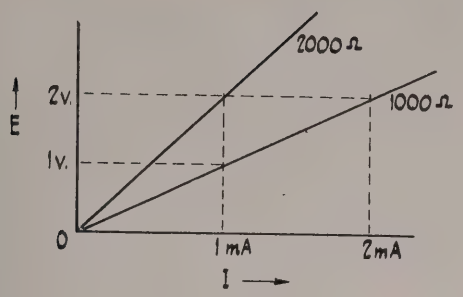


Fig. 1

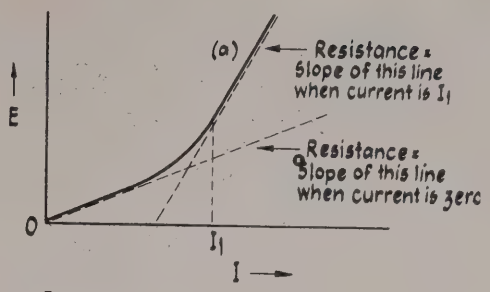


Fig. 2

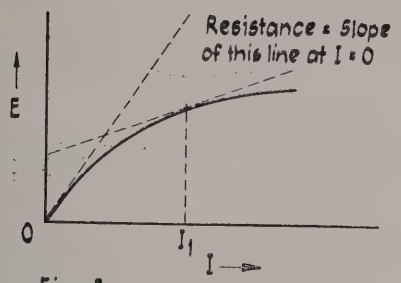


Fig. 3

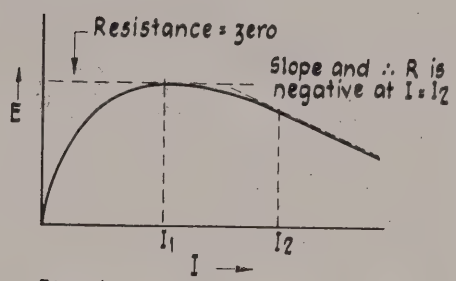


Fig. 4

Readers will remember that with a point-contact transistor, any change in emitter current produces a correspondingly greater current change in the collector circuit. In most point transistors, the collector current change is between two and three times the emitter current change, so that we have a current amplification of two or three times. Now a theoretically perfect transistor would have a base material with zero resistance, but in practice, there is always some resistance present in the base electrode, and this causes positive feedback. For instance, suppose we have a steady emitter current of 1 ma., and a steady collector current of 3 ma. If now the emitter current increases by 0.5 ma., the collector current will increase by say, 1.5 ma. Now both these currents flow in the base circuit, but in opposite directions. In Fig 5 we have drawn a circuit in which we can imagine that the base resistance is zero, but that we have connected a resistor of 100 ohms in series with the base. This is equivalent in all respects to a real transistor, which has the base resistance built in, as it were. The arrows on the emitter and collector sides of the circuit respectively show the directions in which these currents flow. We are now in a position to see what effect the base resistance has on the operation of the transistor. Originally, with 1 ma. and 3 ma. flowing in the emitter and collector circuits respectively, there is a nett base current of 2 ma., in the direction of the collector current. When we cause the emitter current to increase by 0.5 ma., we now have 1.5 ma. emitter current, and 4.5 ma. collector current, so that there is now a nett base current of 3 ma. Before the change, there must have been a potential of —0.2v. between base and earth, but afterwards, this voltage rises to —0.3 volts. There has therefore been an increase of 0.1 volts in the negative potential of the base with respect to earth. Now placing a negative potential on the base has just as much effect on the emitter current as placing an equal positive potential directly on the emitter itself. We know that an increase of positive emitter potential causes an increase in emitter current, so that our original increase in emitter current causes not only an increase in collector current, owing to the transistor's amplifying property, but also a further increase in emitter current. This behaviour is positive feedback, or regeneration, so that the transistor with resistance in

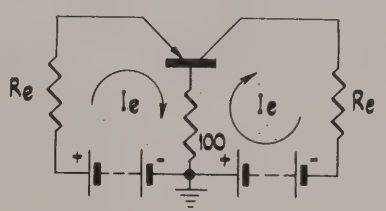


Fig. 5

the base is obviously able to act as an oscillator, provided the circuit conditions are favourable. The fact that regeneration takes place is merely another way of saying that it exhibits negative resistance in the base circuit. It follows therefore, that to make an oscillator out of the circuit of Fig. 5, all we have to do is to place a tuned circuit in the base circuit. Things are not always as simple as they seem, however, and just putting any old tuned circuit in series with the base lead will not necessarily make the circuit oscillate. The impedance of the tuned circuit at its resonant frequency must bear the correct relationship to the value of negative resistance produced by the circuit, otherwise, although the negative resistance (or, if you like it better, the regeneration) is present, oscillation will not take

place. This is similar to the behaviour of a regenerative detector, which will oscillate only if the regeneration is controlled in such a way that the negative resistance reflected across the tuned circuit is able to more than neutralize the positive resistance represented by the tuned circuit. At smaller amounts of regeneration, the circuit does not oscillate.

From Fig. 5 we can also begin to see how such circuits as our multivibrator work. If the base resistance is large enough, the regenerative effect can be very great, especially when the resistance in the emitter circuit is small, and then the circuit is completely unstable. If we have it in such a condition that the emitter and collector currents are very small, and then gradually increase the emitter current, as, for example, by putting a signal voltage on to the emitter via a blocking condenser, much as with a valve's grid, we will find that instead of amplifying the signal, the circuit suddenly jumps to a condition in which the emitter and collector currents are very high. If now we put in a signal in an attempt to decrease the emitter current, we will find that the circuit jumps suddenly back to the cut-off condition, and that whatever we do, it will not stay put, as it were, in a normal amplifying condition. This is exactly the bi-stable trigger circuit which we mentioned earlier on, and it is only a matter of relatively minor modification to turn it into a continuous relaxation oscillator, or a flip-flop, in which it has to be triggered to one of the stable conditions, after which it returns automatically to the original one.

In the next instalment of the series, we will present practical negative-resistance oscillator circuits, including a crystal-controlled oscillator working on the 80 metre band, and capable of being used as a flea-powered transistor CW transmitter.

(To be continued).

Solderless Wiring Connections: Plessey Crimping Techniques

To overcome the disadvantages inherent in normal soldering of joints, The Plessey Co., Ltd., have pioneered and developed the principle of a solderless wiring connection. This ensures a reliable joint regardless of the skill of the operator, and eliminates all troubles due to heat and the corrosive action of fluxes.

Electrical circuits form a critical link in the control of almost every engineering installation, including those machines which are not normally associated with electrical equipment. Defective electrical circuits can immobilise the most vital and costly plant, and are frequently caused by faulty soldered connections which may be impossible to detect visually. Once the soldered joint is sealed there is no way of knowing how many cable strands are oxidised, crystallised by heat or burned. In addition, the heat applied during soldering makes the conductor brittle just at the point where the greatest flexibility is needed with the result that manipulation or vibration eventually fractures the wire.

The Plessey system which overcomes these difficulties was evolved primarily for use in the aircraft industry, but is now being extended to a much wider field of industrial application, being especially useful, for instance, in coal mines and oil refineries, where naked flames might be hazardous.

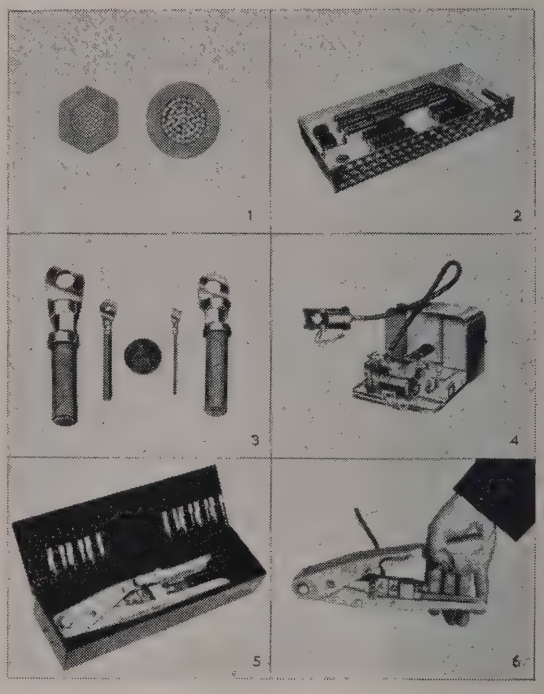
There are two types of solderless crimp—indentation and hexagon. In the first, the indentation type, the solderless wiring connection is made by manually crimping opposite sides of the connection tag so that the wire connector is gripped immovably. The second type, the hexagon, is a later development and was designed to take any size of wire for crimping and is also suitable for use with aluminium cables, which cannot be soldered.

A cable terminal joint made by these methods possesses good electrical continuity, has the ability to withstand heavy vibration and abnormal handling, retains its natural flexibility right up to the point of entry into the terminal and is much less susceptible to corrosion than is a soldered joint.

To prepare these connections the cable end is bared and inserted into the metal sleeve. In the case of the indentation crimp, a special hand-operated tool is then used to perform the crimping operation by producing uniform indentations which swage but do not crush the connector sleeves. The dies used are interchangeable. They are carefully designed and mate accurately to prevent any uneven pressure on the periphery of the connector.

For the hexagon type of crimp, either a hand-operated crimping tool (for light cables) or foot-operated hydraulic tool (for heavier cables) is used. This latter tool is sufficiently powerful to make joints with copper cables carrying up to 280 amps and aluminium cables carrying up to 200 amps. To make these latter connections, the aluminium cable is first suitably treated with an oxide inhibitor before crimping.

Both hand and hydraulic tools are precision instruments built for ease in use and lasting accuracy and protected by plating or enamel. The hand tool is in the form of special pliers,



which can be operated with one hand—a great advantage when joints have to be made in confined spaces. The hand tools for both indentation and hexagon crimping are of similar dimensions and are accommodated in an identical sized box together with interchangeable sets of dies.

Plessey have produced cable terminations for both indentation and hexagon crimp, and in the case of the latter the whole of the pren and prenal range of cables has been catered for. Development work on the hexagon type of crimp is being continued along many lines in association with industrial firms on all types of cable used in industry.

Radio Progress in the N.Z.P.O.

(Continued from page 27)

output coupling so that the stage is somewhat less heavily loaded than usual, so as to make the plate dip more pronounced. Indeed, with some stages, particularly those employing beam tetrodes or pentodes, in which the plate tuning is very "flat" when the stage is fully loaded, reducing the load may be the only method by which neutralization can be carried out at all accurately.

The dotted curves show how the grid current varies when the plate tank is tuned through resonance. Now this variation is not the sudden flick that occurs when the plate circuit of an unneutralized stage is quickly tuned through resonance, but is the gradual change in grid current that always occurs, whether the stage is neutralized or not. It will be seen that on the diagram there are three dotted curves. One shows what happens to the grid current when the neutralizing condenser is too small. Briefly, the peak in the grid current occurs on the low-capacity side of plate circuit resonance, as indicated by the dip in the plate current. When the stage is over-neutralized, the grid current maximum comes slightly on the high-capacity side of resonance, but when neutralization is correct, the grid current peak and the plate current dip coincide exactly.

Thus the neutralizing procedure is as follows:—

(1) With any convenient setting of the neutralizing condenser (or condensers, in the case of a push-pull stage), the plate tank condenser is carefully tuned from the low-capacity end through resonance to the high-capacity end.

(2) As this is done, the grid current meter is watched carefully, and the setting is noted at which the maximum occurs.

(3) The capacity is decreased again, and slowly increased once more, this time noting the dial setting at which the plate current minimum occurs.

(4) The two dial readings are compared, to find whether the plate dip or the grid rise comes first. If the former is first, the stage is over-neutralized, and the condenser(s) must be decreased. If the grid current rise comes first, more neutralizing capacity is needed.

(5) The condenser(s) is adjusted until the rise and dip come at the same capacity setting.

As well as enabling an accurate adjustment to be found, the above procedure is very valuable as a test of what is the matter, in the event that the stage is difficult to neutralize. The most common difficulty is that undesired couplings are such that the stage is over-neutralized, even without the addition of any intentional neutralizing capacity. This state of affairs almost always comes about through faulty construction, such as arises from insufficient shielding between input and output circuits, or through poor lay-out of parts. Any trouble of this sort is easily discovered if an attempt is made to use the neutralizing procedure just described. If additional feedback is present (and by this we mean positive feedback other than that due merely to the grid-plate capacity of the valve), this will be indicated by a much too large value of neutralizing capacity being required before the correct adjustment is obtained. Most commonly, however, this particular fault would result in neutralization still not being obtained even with the neutralizing condenser at maximum capacity. This is because most neutralizing condensers have only a very small capacity, as, if all is well, the capacity should not be any greater than the grid-plate capacity of the tube to be neutralized.

The existence of excessive feedback in opposite phase to that caused by the valve's grid-plate capacity will give the symptoms of over-neutralization. That is to say, even with the neutralizing condenser set to zero, or omitted altogether, the grid current maximum will be found on the high-capacity side of the plate-current dip.

If either of these two symptoms is found, it is an indication that there is undesired feedback from output to input, and this must be cured before neutralization is again tried. In a newly-built transmitter this may seem very sad, and may cause a lot of head-scratching and additional work, but one should not grudge this. Rather should the method of spotting the fault be thanked for giving a lead to what is really wrong. This is much better than an intractable R.F. amplifier stage that never really works properly for some unknown reason!

While there is nothing new about the method described, it is one that this journal thought was worthy of being better known by amateur transmitters (and others) than it is, and we hope readers will find it as useful a tip as we have ourselves.

Canadian Trade Fairs and Exhibitions

For the benefit of readers who may be visiting Canada during the first half of 1955, we publish the following list of Canadian Trade Shows which has been supplied by the Office of the High Commissioner for Canada, Wellington, which would be glad to supply any further information required.

CANADIAN TRADE SHOWS

National Gift Show
Exhibition Park, Toronto.
February 21 to 24, 1955.
For information: Angus Baxter, 9 Duke Street, Toronto.

Canadian Toy Fair
Mount Royal Hotel, Montreal.
February 28 to March 4, 1955.
For information: W. J. Cannon, Canadian Playthings Manufacturers Inc., Room 308, 330 Bay Street, Toronto 1.

Better Home Builders Show
Show Mart, Montreal.
April 18 to 23, 1955.
For information: Eastern Canada Exhibition Inc., 423 Ontario Street, East, Montreal.

Office Machinery and Equipment Exposition
Mutual Street, Arena, Toronto.
May 22 to 26, 1955.
For information: E. L. Smart, Confederation Life Association, 12 Richmond Street, E., Toronto.

Eighth Canadian International Trade Fair
Exhibition Park, Toronto.
May 30 to June 10, 1955.
For information: The Administrator, Canadian International Trade Fair, Exhibition Park, Toronto.

TESTS ON A SYNCHRODYNE RECEIVER

Since we published constructional details of a synchrodyne receiver in the September 1954 issue of "Radio and Electrical Review," the interest displayed in it has been rather staggering. We have had more telephone calls, and requests to come and hear the original model working than have been caused by anything ever published in these pages. All this has been very gratifying, even if we ourselves cannot claim to have done anything at all original in building something which was virtually designed for us in advance by the inventor of the arrangement, Dr. D. G. Tucker.

Even more gratifying, however, are the results of some tests which were undertaken by one of the best-equipped radio laboratories in the country, and we feel sure that readers will be interested in the test report, which we print verbatim, below.

For these tests the receiver was fed from the GR. 805-C Signal Generator via the dummy load. The output was fed through a two-stage audio amplifier of known characteristics to obtain sufficient level for measurements on the GR. Noise and Distortion Meter. Tests were taken at a frequency of 660 Kc/s. No adjustments were made to the receiver other than peaking the aerial trimmer.

(1) Frequency response:

This was taken with 1 mV in at 30 per cent. modulation.

Frequency	Output
25 c/s.	—1 db.
40 c/s.	—0.5 db.
60 c/s.	—0.4 db.
100 c/s.	—0.3 db.
300 c/s.	—0.1 db.
1,000 c/s.	0. db.
6,000 c/s.	0 db.
7,000 c/s.	—0.1 db.
8,000 c/s.	—0.2 db.
9,000 c/s.	—0.4 db.
10,000 c/s.	—0.7 db.
12,000 c/s.	—1.2 db.
15,000 c/s.	—2.4 db.
20,000 c/s.	—4.6 db.

(2) Distortion:

Input level 2 mV.:

Frequency	30% Mod.	90% Mod.
60 c/s.	1. 7%	4 %
100 c/s.	1. 2%	3 %
1,000 c/s.	1 %	2.7%
10,000 c/s.	0.95%	2.4%

These figures are below the rated performance figures for the Signal Generator.

(3) Overload Point:

Distortion measurements were made with 400 c/s. 30% modulation at increasing input levels.

Level	Distortion
1.15 mV.	1. 1%
5 mV.	0.85%
6 mV.	3.....%

(4) With an input signal approximately 300 c/s. off frequency and with 30 per cent. 400 c/s. modulation, an input level of 200 microvolts was required to sync. the oscillator.

(5) With 90 per cent modulation, the input level required to obtain sync. at all frequencies higher than that listed is as follows:

Frequency	Input level
40 c/s.	1.6 mV.
50 c/s.	1.5 mV.
100 c/s.	1 mV.
200 c/s.	500 uV.
400 c/s.	400 uV.

For instance, a 1 mV. signal will lock the oscillator only for modulating frequencies above 100 c/s., and for frequencies above 40 c/s. a 1.6 mV. input signal is required.

(6) With a 1 mV. input signal, 30 per cent. 400 c/s. modulated, sync. is maintained over an input frequency range of ± 3.3 Kc/s.

With a 500 microvolt input signal, sync. is maintained over a range of ± 2.6 Kc/s.

For those who may not be used to examing sets of figures like the above, the following notes may be of assistance. The notes are our own.

First of all, it will be seen that the response is flat within 1 db. from 25 c/sec. to over 12,000 c/sec. Thus, for transmitters which are modulated by frequencies not higher than the latter, the response is incapable of improvement. The roll-off above 12,000 c/sec. can probably be put down to (a) the existence of a broadly tuned circuit ahead of the receiver proper, and (b) to the roll-off of the built-in pentode audio amplifier stage following the demodulator. For special purposes, there is little doubt that the response could be made even flatter within the range of 25 to 20,000 c/sec., although it is very doubtful whether anyone could be found who could pick the difference by ear.

Secondly, some comment is in order with regard to the distortion figures. Since they are all stated to be below the rated performance figures for the signal generator, all that can be said is that the figures quoted were not exceeded. The inference is, of course, that the distortion in the receiver is possibly less than the figures state, but there is no proof that it is less. In any event, the figures are considerably less than those obtained on conventional superheterodyne receivers, in which the distortion is often found to be in excess of 20 per cent. at high modulation levels.

Paragraph 3 of the tests is given in order to show how the receiver behaves in the presence of stronger signals than the best input signal strength. It is a pity that enough points were not taken to enable a curve to be drawn, but the three readings taken do indicate that above 6 mV. input, the distortion begins to increase, and our own observation is that this increase takes place quite sharply, indicating that it will be quite easy to judge whether too great a signal is being fed into the receiver, even without the use of instruments.

A Survey of Radio Progress in the New Zealand Post Office

By G. SEARLE, M.Sc.(Hons.), A.M.I.E.E.

Published through the courtesy of the New Zealand Post Office and New Zealand Radio and Television Manufacturers' Federation

The following is the text of an address delivered to the recent conference of the New Zealand Radio and Television Manufacturers' Federation by Mr. G. Searle, Divisional Engineer (Radio) of the General Post Office.

GENERAL

The war years brought extremely rapid advances in the design of defence radio equipment, but the repercussions of these advances on the acceleration of general civil radio development was not apparent until some years after the end of the war. However, it is deemed expedient from the viewpoint of recent Post Office civil radio developments to commence this study in the year 1944, since we have been building on a basis formulated in many cases at about that time. Consequently, this talk will deal with developments in the past ten years.

In the period being considered, developments in radio communication have been affected to a considerable degree by congestion in the medium and high radio frequency range of the spectrum. This, together with economic considerations, has had the effect of accelerating the trend towards the use of much higher frequencies extending into the microwave range, and a simultaneous improvement in equipment performance standards in cases where services are necessarily retained in the high-frequency range. Such improvements have been necessitated by the need to place more channels in the H.F. range and simultaneously to reduce the effects of increasing adjacent channel interference. Similarly, as need is being experienced to compress the information to be carried on any channel into the minimum bandwidth space, a higher degree of equipment stability and other improved standards has been needed.

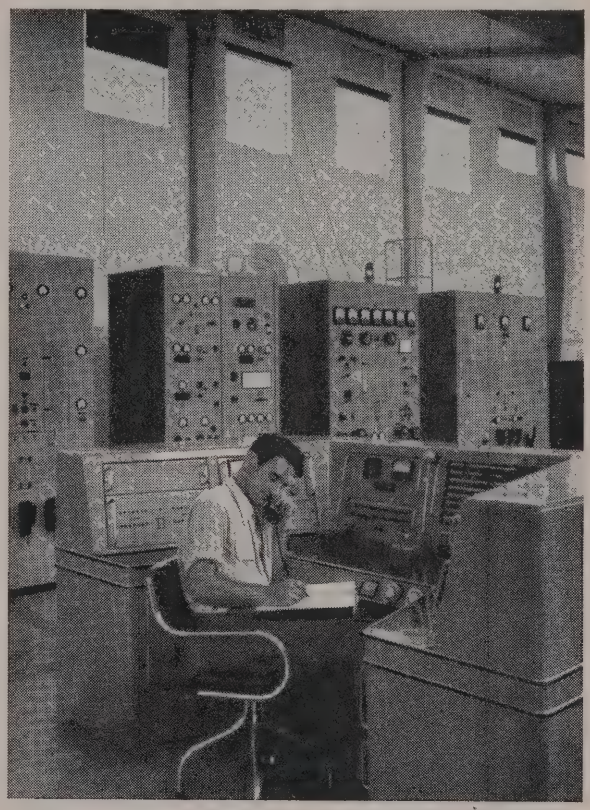
The congestion referred to has brought with it a need for more frequent consultations relating to the use of frequencies which are likely to cause international harmful interference, and, despite the difficulties which have been brought about by the present condition of the world, considerable progress has been made in this direction. As regards the V.H.F. spectrum, we are fortunate in New Zealand to be so isolated from other countries that the question of negotiation for the use of such frequencies does not arise except in those cases where international shipping or aircraft carry frequencies into our area.

In the Post Office, the most important advances have accordingly been made in the following fields:—

(1) Frequency negotiation and consequential action;

(2) Long-distance radio communications;

(3) Short-distance radio communications;



Control console, and in the background, a 50 kw. telegraph transmitter at Himatangi Radio, the recently completed transmitting station operated by the P. and T. Department.

(4) Land mobile radio services;

(5) Equipment design and station provision; and

(6) Radio regulatory (inspection).

The advances made are such that the radio picture today is completely different from what it was ten years ago, and in many cases we are even now at

such a stage that technical developments can alter our way of thinking profoundly.

It is proposed to describe some of the more important advances made in the fields already referred to, and these will now be dealt with.

1. Frequency Negotiation and Consequential Action

It is a fair statement to make that if there are not clear frequencies available for services to operate on, then radios have not much effective application. Consequently, it is a first essential that the control of frequencies must be fully safeguarded in order that

Central operating room at the Wellington G.P.O. for overseas radio-telegraph services. This is where overseas telegrams are sent and received, the transmitters being at Himatangi and Tinakori, and the reeiving station at Quartz Hill, Makara.

harmful co-channel and adjacent interference may be reduced to a minimum. This applies not only to the international field but also to our domestic field, for, if there is reason to avoid international interference, then there is every reason to ensure that all such frequency allocation matters are under adequate internal control. Consequently, it has been necessary to revise rather extensively our internal allocation procedure.

The war left the radio frequency spectrum in a chaotic condition. New radio services had sprung up during the period, thousands of new frequencies had been assigned throughout the world without any overall semblance of order, and, in addition, the rapidly growing aviation industry was demanding a considerable amount of spectrum space. Superimposed on this condition was the rapid growth made by radio during the war years and the tremendous potentiality in the world demand for more communications. It was obvious that arrangements were needed to provide for a properly co-ordinated system of assigning frequencies internationally, and for a methodical and uniform approach to the problem.

Accordingly, between 1947 and 1953 a series of important international radio conferences was convened, commencing in 1947 with a conference at Atlantic City to revise the general radio regulations and the frequency allocation table. Space having been assigned in this table to the various services—i.e., broadcasting, fixed maritime mobile, aeronautical mobile, land mobile, etc.—conferences were convened to prepare detailed plans for the separate assignments of all countries in the various bands so designated. At the conclusion of this particular conference we found that New Zealand, using approximately 800 frequencies capable of causing international interference, had approximately 400 frequencies in incorrect frequency bands and that these required to be shifted. Frequency planning conferences and meetings in which New Zealand was involved were convened as follows:

Higher Frequency Broadcasting: Geneva and Mexico City, 1948; Paris, 1949; Rapallo, 1950.

Aeronautical Radio: Geneva, 1948; Geneva, 1949.

Maritime Mobile and Fixed Services: Geneva, 1948; Geneva, 1949; Geneva, 1950.

Frequencies below about 4 mc/s.: Geneva, 1948; Geneva, 1949; Wellington, 1950; Melbourne, 1953.

A conference which was held in Geneva in 1951 co-ordinated and revised all the draft plans which had been prepared up to that time, and, where plans had not been prepared, formulated procedures prescribing the action which would be taken by the various countries of the world in determining what came to be known as "in-band" assignments.

Plans for the assignment and sharing of frequencies below 4 mc/s. were finally approved, as were plans for the maritime mobile services (both telegraphy and telephony) and plans for the aeronautical mobile service (internal and international air routes). This was a considerable step forward in international frequency negotiation, but it is unfortunate that to date no generally acceptable plans have been prepared for either the high-frequency broadcasting or fixed services. To a greater or lsser degree, therefore, an approach based on trial and first occupier applies to the operation of these services. The congestion in the fixed service bands is extremely serious at the present time. Despite approximately two and a half years' intensive work in an endeavour to prepare a fixed service plan, it was found that the stated requirements of countries for spectrum space far exceeded what the spectrum could provide, and the same applied to high-frequency broadcasting. Nevertheless, the work performed in endeavouring to formulate a plan for all these services was not altogether lost. Valuable technical information was prepared and a great deal of educational work accomplished. In the case of the fixed service conferences, a considerable step forward was made in the preparation of engineering data which enables a frequency complement to be selected by reference to tables for any type of radio circuit with terminals at any geographical location.

The majority of the 400 New Zealand frequencies referred to above and which were operating out of proper bands are now all within their correct bands. The work entailed was a formidable task, as the 400 frequencies represent some thousands of stations, and frequency control, equipment, and antennas are affected. We are now able to say, with a very few exceptions, that all New Zealand frequencies are operating within their correct planned locations. This is a major step forward, and has been made possible only by the series of conferences referred to and the very close liaison which has been established with the frequency assigning authorities in Australia. It is necessary to say, of course, that in this work the Post Office has been very closely assisted by the broadcasting, civil aviation, and defence authorities.

The position reached requires continual vigilance, inasmuch as competition for international frequencies is extremely severe and all countries have rapidly learned to consider protected frequencies as one of their important national resources.

Our work in this field in New Zealand has been assisted by the establishment at Mount Crawford of a monitoring station devoted to questions of frequency selection and international interference. The station operates in conjunction with the frequency measuring station at Makara Radio and is equipped with up-to-date technical apparatus. It was established in 1951 as a result of the difficulties being experienced in reaching full agreement on the international use of frequencies, and we work closely with other administrations as well as the international authorities in this sphere. It is proposed to equip this station with automatic frequency registering equipment within the next twelve months. Concurrently with this improvement, the frequency measuring apparatus at Makara Radio will be improved. A new three-oscillator primary standard of frequency will be provided, and new station frequency measuring equipment installed. The latter will enable a greater number of measurements per hour to be taken.

At an early stage in the international negotiations, it was evident that a great number of New Zealand radio stations would require to change frequency as a result of the conferences referred to, and it was already known that, to extract the maximum number of circuits from the frequency space available, frequency tolerances would require to be tightened. Accordingly, it was deemed appropriate to proceed with improved crystal processing plant, and in 1951 a Post Office technician proceeded to the United Kingdom for about six months' study with the British Post Office. In 1952, a new crystal processing laboratory was brought into use, and in December of that year the first plated and wire-mounted crystals were produced. The following year saw the first batch of evacuated glass-enveloped crystals produced, and since that date about 4,000 silver-plated crystal units have been produced, primarily for Post Office and other Government services. The ability to produce our own crystals quickly has facilitated the frequency transfer referred to and has been of inestimable value in that comparatively early registration dates have been obtained for frequencies affected by the great frequency change-over.

It was not without considerable forethought that this action was taken by the Post Office. Endeavours were made in advance to encourage local industry to take on the work, but the equipment required is expensive and extremely complex, and in the end it was deemed necessary to proceed ourselves.

Present developments are along the lines of purchasing bulk quartz and cutting blanks ourselves. The laboratory will then be completely equipped with cutting, plating, and evacuating equipment as well as X-ray apparatus.

2. Long-distance Communications

As would be expected with the ever-increasing demand for faster, better, and more communication facilities, the expansion and reconstruction in this field has been considerable. Following the war, our overseas services amounted to one radiotelephone circuit to Australia and thence to the United Kingdom, a radiotelegraph circuit to the United States, and radiotelegraph circuits to some of the Pacific Islands, but from 1945 onwards developments were rapid.

(a) Radio Telephony

In 1945, a double sideband service to San Francisco was established, and the following years were devoted to procurement and preparing for single sideband and independent sideband equipment, so that in 1951 the United States radiotelephone circuit was able to be converted to single sideband working in the direction United States to New Zealand, the other side of the circuit being converted to single sideband working in 1953.

The single channel double-sideband radiotelephone circuit to Australia was increased from 1 kW. to 5 kW., but was inadequate by 1950, and a two-channel circuit was opened in 1951. This circuit was established on an up-to-date basis using independent sideband transmission (4 kW.), two telephone circuits being carried on the one transmitter. During peak periods in 1953, it was found that two channels to Australia were inadequate, and on occasions four channels using two transmitters were used. Plans are now in hand to provide for the permanent expansion of the service from two channels.

In 1952, more modern equipment for the overseas telephone services was provided at the Stout Street Exchange for combining the circuits from receivers, transmitters, and subscribers' telephones, six new positions being installed, making a total of eight, and at the same time an improved form of privacy safeguard was installed and inaugurated on the Australian and United States radiotelephone services. The following year saw the inauguration of the direct New Zealand-United Kingdom radiotelephone circuit, facilities for twin-channel operation being provided in New Zealand with multi-band privacy facilities in time for use with the Royal Tour of New Zealand.

Work is at present being conducted with a view to the technical improvement of the radiotelephone service, the propagational and other difficulties experienced on the circuit making it an extremely difficult proposition.

During the same period, radiotelephone services connecting into the public telephone network were established for Transtasman and other shipping, and radiotelephone circuits to Raoul Island, Campbell Island, and Chatham Islands were established.

(b) Radio Telegraphy

In 1949, a radiotelegraph link with Barbados was established in order to form portion of a radiotelegraph circuit to the United Kingdom. Hitherto, there had been an emergency type of radiotelegraph service working direct on an extremely intermittent basis. The code used was high-speed morse, with on/off keying.

In 1951, more modern developments were being applied, and the radiotelegraph circuit from New Zealand to United States was converted to frequency shift keying using the five-unit telegraph code—a development of importance.

The year 1953 saw the establishment of a direct telegraph circuit to the United Kingdom on a more powerful basis with facilities for working through Barbados as a repeater station in the New Zealand-Barbados-United Kingdom chain (60 kW. Wheatstone F.S.K.).

Mention should also be made of the establishment on a permanent basis of a radiotelegraph circuit to

(Continued on page 50).

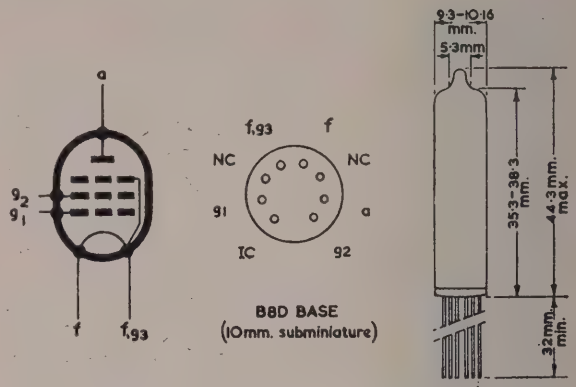
TUBE DATA

Two New Subminiatures for R.F. Application

Information by courtesy of Philips Electrical Industries of N.Z. Ltd.

These new subminiatures will be of great interest to all those concerned with battery-operated radio-telephone equipment, both amateur and professional. They supplement the range of subminiature tubes, being specially designed for producing reasonable amounts of power at very high frequencies.

The DL70 will be good for frequencies at least up to 100 mc/sec., and probably higher, but the preliminary data available do not state what the maximum operational frequency is. The DC70, however, will act as a self-controlled oscillator up to 500 mc/sec. As an amplifier or frequency multiplier, the upper useful limit will be somewhat lower than this, partly because the driving power needed at such high frequencies will be difficult to obtain. However, these two tubes should open up new possibilities in the design of light and compact portable equipment.



Above:—Base connections and electrode arrangement of the DL70. Belows—Data on the DC70.

SUBMINIATURE R.F. OUTPUT PENTODE **DL70**

Subminiature output pentode suitable for R.F. applications in battery-operated equipment.

PRELIMINARY DATA

FILAMENT

V_f	1.25	V
I_f	0.11	A

MOUNTING POSITION Any

Note—Direct soldered connections to the leads of this valve must be at least 5 mm. from the seal and any bending of the valve leads must be at least 1.5 mm. from the seal.

CAPACITANCES (Measured with external screen)

C_{a-g1}	<0.1	μμF
C_{in}	3	μμF
C_{out}	7	μμF

CHARACTERISTICS

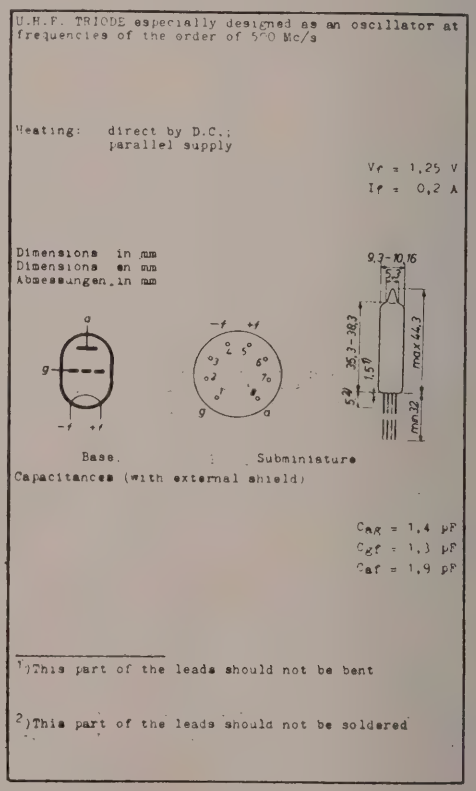
V_a	150	V
V_{g2}	90	V
I_a	6.5	mA
I_{g2}	1.4	mA
V_{g1}	-7.5	V
g_m	1.5	mA/V

OPERATING CONDITIONS AS CLASS "C" R.F. AMPLIFIER AT 100 Mc/s

V_a	150	V
V_{g2}	110	V
V_{g1}	-22	V
I_k	10	mA
I_{g2}	2.8	mA
P_{out}	850	mW

LIMITING VALUES

V_a max.	150	V
p_a max.	1.0	W
V_{g2} max.	150	V
p_{g2} max.	0.45	W
V_{g1} max.	-30	V
V_f max. (absolute)	1.35	V
I_k max.	13	mA



Typical characteristics

V_a	=	150 V
I_a	=	12 mA
V_{g1}	=	-4,5 V
S	=	3,4 mA/V
μ	=	14
R_i	=	4 kΩ

Operating characteristics as oscillator at 500 Mc/s

V_a	=	150 V
I_k	=	20 mA
W_o	=	450 mW

Limiting values

V_a	= max.	150 V
W_a	= max.	2,4 W
V_f	= max.	1,35 V [3]
I_k	= max.	20 mA
I_g	= max.	5 mA

[3]) Absolute value

CONTACTLESS SELF-WINDING ELECTRIC CABLE REELS

Specially interesting to many branches of electrical engineering is the latest "Wayne" range of patent contactless type self-winding electric cable reels, These are produced by Power House Components Ltd., King Street, Nottingham, England, under the directorship of David Rushworth, and carry the registered trade mark "P.H.C."

The general principle of the standard reel, which is available in many different types and sizes, is similar to that of the spring roller blind, the cable being pulled out as required against the action of a spring which ensures that it is kept taut and when released winds smoothly back again. This results in a great improvement in the working of electric cables of all kinds, including reduced wear and tear and maintenance costs.

From this basic principle, however, many important developments have gradually been evolved, including particularly the "Wayne" patent trailer (contactless) type. This is of the double type which pays out two lines of cable in opposite directions so that the reel can be placed in the centre of the work and double the amount of cable handled because the pay-out is in two directions at once whilst current carrying slip-rings are eliminated.

The reel positions itself at points midway between the static electrical connection and the equipment being served, such as for example, an electric hoist, but it must move along the rolled steel joist which carries the hoist, or otherwise the cable attached to the supply point would sag as it is paid off the drum. An important feature is that the rubber cable is not broken between the point of contact with the machine being supplied with current, and at the other end of the cable where it is connected to the electric supply point.

These contactless designs are particularly valuable in the case of bad operating conditions, such as when large quantities of injurious dust may be present in the atmosphere or in cases where the atmosphere is vapour bound, due to process work or outdoor situations. In laboratory work where highly inflammable vapours are present or when handling explosives, the contactless design is, of course, highly desirable.

Another interesting application is electric lifting magnets in which the safety factor in providing current to the magnet must be kept very high in order to eliminate any risk of current failure while the magnet is being used, and probably swinging a load of steel over delicate machinery, or in other situations where a failure in the load would have serious results.

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CHANGE OF ADDRESS

When you change your address, be sure to notify the Subscription Department, "Radio and Electrical Review," P.O. Box 8022, Wellington, New Zealand, and do this at least four weeks in advance. To avoid disappointment through not receiving your copy of "Radio and Electrical Review," should it go to the wrong address through your failure to notify us of a change, we earnestly ask for your co-operation in this important matter.

It pays to stock

- More people ask for EUTRON by name than any other brand. Improved insulation and earthing make EUTRON the safest and most reliable element to recommend.
- Advertised over 11 radio stations throughout New Zealand and sold only through legitimate retailers.

Manufactured by ELECTRIC UTILITIES CO. LTD., 316 Great North Road, Grey Lynn, Auckland, W.2.

(Subsidiary of Nicholson's Holdings Ltd.)

CASH-IN ON EUTRON POPULARITY

ELECTRICAL AND TRADE SECTION

RADIO AND ELECTRICAL MARKETING

By W. L. Young

The year 1954 was an excellent trading year, and all radio and electrical retailers have effected such buoyant sales that there may be a tendency towards complacency as far as sales promotion is concerned. With returns at a high level, such feelings are to a degree understandable, even though they are undesirable. Generally speaking, 1954 saw the consumer demand in most instances in excess of supply. Then towards the end of the year, the English wharf strike brought shortages, which gave an artificial fillip to sales. Complacency is a bad thing, and undoubtedly most businesses could have done a little more had they wished to, or had been farsighted enough in their buyings. However, that was 1954, and with the holiday season behind us, we now have a new trading year ahead.

The purpose of this article is to direct attention to the range of merchandise stocked by the average radio and electrical store. It is impossible to give a general pattern of the stock carried by a radio and electrical store, because, fortunately or otherwise, many sidelines not associated with radio and electrical goods have crept into the business. Whether such sidelines are worth while is something which only individual retailers can evaluate. Apart from these odd lines, however, the question of the range of normal radio and electrical goods is one which could well be taken stock of. The urgent need in any business today is additional capital. The unit value of all merchandise has itself increased, and, furthermore, the quantity of goods now being sold on time payment, with low deposits, is further taxing the financial capacity of many retailers.

We know the banking authorities have clearly indicated that during the forthcoming year bank accommodation or overdrafts are going to be closely watched and limited, so that if a problem exists now regarding shortage of capital, undoubtedly this will become more acute as the year goes by. Relating this to stock, which is the main point of this article, any surplus or unnecessary stock that is carried or any stock which is too slow moving to justify itself, is further taxing the financial resources of the business. Obviously, if a retailer has £500 tied up in dead or slow-selling stock, this £500 could be put into fast-moving stock or be placed to a retailer's credit in the bank account.

While the ability to meet customer requests is an admirable thing, and every retailer likes to think that he is giving his customer full service, there comes the point where a line must be drawn with regard to stock held. Our accounting friends refer to "stock turn," which means the converting of stock into cash, and the more successful the business, the more frequently is this done. Every time stock is turned over, this means the profit of such stock is put back into the business. Stock which is not turning over is not putting back any profit into the business, and is tying up capital. Worse still, unlike capital or cash, such stock can become damaged or obsolete, neither of which is desirable.

Many retailers consider stocktaking a time when stock should be counted and valued with a view to checking that stock does tally with records which are kept. Furthermore, the value of such stock provides figures from which the year's profit can be worked out.

There is an additional important point which is all too frequently overlooked, and that is, stocktaking gives a retailer an opportunity of going over all his stock physically, and from such examination, much can be learnt regarding the stock pattern of a business. While stock may be on cards, seeing it on the shelves drives home the fact that it is really still unsold.

Let us consider first of all, the main lines in a business: Retailers will have certain franchise lines, such as radios, vacuum cleaners, refrigerators, washing machines, etc. In general terms it can be taken that no detailed consideration need be given to any of these items, except to say that it is noticeable that, with radio in particular, there is a tendency for a dealer to stock too many brands. While it can be claimed that these additional brands give wider selection to the retail customer, the wide range can also confuse. The answer which is frequently given, "I let the customer choose," is indeed a weak one, because the customer all too frequently knows very little about radios, and is looking for guidance.

The retailer who has a limited number of makes has a distinct advantage in that he can give a customer a little guidance and exert his powers of salesmanship. If he doesn't, then the customer will most certainly come in contact with a radio dealer who has a limited number of makes and who is prepared to get behind them. A further answer which is sometimes given when this vexed question is raised is: "I stock these other makes, but I never push them." This argument, too, can be faulted on the ground that if lines are not going to be pushed they should not be on the retailers' shelves at all. It does not take a great deal of radio stock to total up to £500, and two makes of radio, even though they be secondary lines, could well approximate this figure, thus tying up unnecessarily £500 of capital which could be well used elsewhere. So much for the comment that you can carry too many brands of radio.

The only other matters regarding radio which should be carefully watched are the questions of obsolete models and trade-ins. Once a model has been replaced, a dealer should make the strongest efforts possible to get rid of what is virtually an old model. The longer this model remains on stock, the older it gets, and the less interest sales personnel will have in it. The distributors will no longer be nationally advertising the model; in fact, national

advertising will probably be directed to the successor, thus further dampening prospects of a sale.

Digressing a little, the writer well recalls recently seeing a multi-band console receiver which was obviously three or four years old. The dealer stated, "We cannot sell this," and when asked why, gave the answer, "Nobody wants it." Admittedly, this set went back to the time when straight consoles were acceptable as compared with console radiograms, but when closer inspection showed that the cabinet was severely chipped, the decals were bent to the point where they were unreadable, and the volume control did not function, readers will understand what is meant by obsolete stock, suffering damage, and not being properly cared for. This same thing can happen in your store, but it won't if you are on the lookout for it. On the question of trade-ins, suffice to say that these should be kept at a minimum level. If trade-ins tend to build up, it is an obvious indication that too much is being offered for them.

We will now focus our attention on general lines which are carried. Any retailer will freely admit that, in general terms, he is carrying too many lines, and that some are much more popular than others. You must be always practical in business, and if you find you are not turning over certain lines, it is important that you should quit them, and not replace them. Worse still, stocktaking may reveal to a retailer that he has in stock many lines which are virtually orphans in that replacements, even if they are wanted, are not available. Such lines should be disposed of at the earliest opportunity. The whole object of a retailer should be to carry lines which are quick selling, which are wellknown, and which have adequate spares and service facilities to back them up. Obviously the lines which are well known are those which are supported by substantial national advertising, thus bringing them under the forceful notice of the consuming public. On the question of adequate spares and service, this is a matter which a dealer can only judge for himself in the light of experience.

We now come finally to the question of these odd lines, not akin to the business, which find their way into the retailer's stock. Some of these seem to have no relation whatsoever to normal trading, others appear to have special seasonal sales value. Unless these odd lines are moving swiftly and fully justifying the presence and room they are taking up, they should be disposed of, because they are only dissipating the efforts of your sales force. With regard to the items of seasonal appeal, once the appropriate season is over, if these are going to lie on your shelves awaiting the next selling season, you would be well advised to turn these into cash.

Retailers must realize that business today is very complex. Costs are high and all steps to reduce costs and overhead must be closely examined. The importance, therefore, of good quick-moving lines must never be lost sight of. Apart from the fact that slow lines in themselves eat up capital and take up shelf space, there is even a worse feature in that half-hearted attention is given to such slow-moving lines from time to time without much effect. This time could be used to much better purpose on standard lines.

Make a New Year resolution to go over all stock, deleting those lines which are not playing their part in the development of your business. True, you may miss an odd sale, but sales volume is not the only objective of trading; the main objective of any business is, at the end of the year, to achieve a certain net profit, which of necessity is related to a given turnover. However, turnover merely for the sake of figures is highly undesirable.

Remember, if you are a radio and electrical trader, be satisfied to fill the functions expected of you, but do not try to stock anything and everything. You have developed special skill in the management of a radio and electrical business. Use this to the utmost, and do not try and cut across the path of another trader, who perhaps has even greater skill than yourself in the buying and selling of lines which you might be tempted to embrace, but which are not truly an integral part of your type of business.

"Radio New Zealand" Frequencies

From Friday 3rd December, 1954 (N.Z. date) "Radio New Zealand" will transmit in accordance with the following frequency schedule:—

TO AUSTRALIA

2000–0600 GMT ZL19 11.83 Mc/s. in 25 Metre Band
0615 Close down ZL18 9.52 Mc/s. in 31 Metre Band

TO PACIFIC ISLANDS

1700–0600 GMT ZL3 11.78 Mc/s in 25 Metre Band
0615 Close down ZL7 6.08 Mc/s. in 49 Metre Band
Close down is at 1045 GMT on week-days.
Close down is at 1120 GMT on Saturdays.
Close down is at 1060 GMT on Sundays.

News Bulletins may be heard at:—

0033 hours GMT (N.Z. News).
0630 hours GMT (London News).
0830 hours GMT (N.Z. News).
1030 hours GMT (N.Z. News).

Please note particularly that transmissions to Australia and the Pacific Islands now commence at 2000 hours GMT and 1700 hours GMT respectively, instead of at 1800 hours GMT.

These new commencing times will be adhered to in the future.

ACKNOWLEDGEMENT
INDUCTANCE OF SINGLE-LAYER COILS
(Vol. 9, No. 5, July, 1954.)

We owe grateful acknowledgement to "La Radio en TV Revue," of Antwerp, Belgium, for permission to print the diagrams which appeared on page 33 of our July, 1954, number, and regret that this acknowledgement was omitted from the heading on the article.

"R & E" TECHNICAL PHOTOGRAPHS

Copies of original designs produced in our laboratory and featured in these pages are available. Prices are: Size 6 in. x 4 in. 3s. 6d.; 8 x 6, 4s. 6d.; 10 x 8, 5s. 6d. Please remit cash with order to Radio and Electronics (N.Z.) Ltd., P.O. Box 8022, Wellington.

TRADE WINDS

Overseas with Mr. E. E. Parnase of Amalgamated Wireless Australasia Ltd., Wellington.

Just back from a hurried, but nevertheless stimulating trip overseas, Mr. E. E. Parnase, of Amalgamated Wireless (Australasia) Ltd., has an interesting story to tell.

Cheered on his way at Fiji by two delightful C.A.A. personalities, Harry Brown and Don Logan, Mr. Pernase's next stop was at Honolulu where he was fortunate to be shown over the Naval Installations. The change to T.C.A. aircraft was made at Vancouver, and we quote Mr. Pernase's graphic description of this service. "T.C.A. aircraft reminds one of a tram of the air. At each stop the passengers pour out, and the passengers pour in, and 'it's hold on to your hat boys, we're off again!'" From Montreal he flew down to New York, thence to Boston, and so to London.

Two weeks were spent with Marconi Instruments Limited in London and at their Works at St. Albans, during which time a demonstration was given to the medical profession of the Marconi Image Amplifier, which is a new development expected to revolutionize diagnostic radiology. By means of an image converter tube and associated optical system, an image is produced which is considerably brighter and has a better definition than the conventional fluoroscopy screen. A cine camera can be mounted on the unit, thus permitting cine radiography. A number of new X-ray designs were also announced by Marconi's at this convention.

At Chelmsford, where he remained for two weeks, he saw all the new communications and industrial instruments developed by Marconi Instruments Ltd. which are to be released in 1955. The intensive research and vigorous activity of the Marconi group of companies was most impressive.

At one of the five Marconi research establishments he saw Centimetric link equipment undergoing life tests. Ultimately, this equipment will be capable of carrying 600 telephone channels and more.

Marconi's Broadcasting Division is very busy manufacturing television equipment destined for all parts of the world, and vigorously pursuing research in to television. Demonstrations using the 625 line system were given of the new Marconi television camera which uses a 4½ in. Image Orthicon tube manufactured by the English Electic Valve Co. Ltd., to which Marconi is related. The black and white picture viewed on a 24 in. screen appeared perfect.

According to Mr. Pernase, we can expect Marconi's to announce soon new developments in the fields of Radar and Aeronautical communications to which they are devoting much attention.

In company with Mr. Craig, the London Manager, Mr. Pernase attended the R.A.M.A.C. Conference in Hamburg, and while in Germany took the opportunity to visit the works of various German manufacturers, thus being able to inspect the latest German designs in communication equipment. In passing, he noted the enthusiasm with which the Germans were working long hours in an endeavour to rebuild their nation. In fact, at first glance Hamburg appeared to be completely rebuilt, though of course there were still some areas of devastation.

After a brief visit to Denmark, Mr. Pernase went on to Sweden, enjoying there the wonderful Swedish hospitality, and inspecting the works of Georg Schonander, X-ray manufacturers, represented by A.W.A. in N.Z.

Back in London again he visited the Telegraph Construction and Maintenance Co. Ltd., and at their Greenwich Works saw the new Atlantic Telephone Cable in the course of manufacture. Under the direction of Dr. Latimer, there is tremendous research activity in progress at Telcon's Works, and it seems we can look forward to further new developments in the field of plastic cables, a product in which Telcon have specialized and for which they have become world renowned.

The works of A.W.A's. English Associates, Telephone Manufacturing Co. Ltd. were visited, and here Mr. Pernase was able to see the new British Crossbar Telephone Exchanges on cycling tests. The reliability of the T.M.C. Crossbar System has fully justified the immense amount of developmental work and expense which has been devoted to this project. Most engineers know the T.M.C. high speed Carpenter Relay. T.M.C. are continuing their research into relays, and, in due course, they will be releasing greatly miniaturised relays of improved performance. In fact, Mr. Parnase was shown a high speed relay which would fit into a B7G valve envelope!

At Newcastle Mr. Pernase met Dr. Farmer of the Royal Infirmary Cancer Hospital and saw a number of Marconi Deep Therapy plants in operation. He also found time for a peep "over the border" at other Marconi installations in Scotland.

On the way home, two very active weeks were spent in New York with R.C.A. officials. A day was spent with N.B.C. on television, and here Mr. Parnase was fascinated by the production studio, where the scenery was ever-changing, stage settings moving on and off at regular intervals as programmes changed. Incidentally, he tells us that he also had occasion to tune in on his television receiver in his hotel room at 3 a.m. at which time there were three TV stations on the air!

At an R.C.A. colour TV demonstration, the picture was magnificent, the compatibility of the transmission being shown by an accompanying black and white receiver. There appeared to be absolutely no deterioration in the black and white picture, and in fact, Mr. Pernase considered that the dot structure of the latter was an improvement on rather than a deterioration from the line structure in normal transmissions.

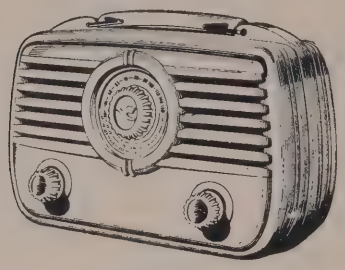
While in New York he arranged with Keleket X-ray Corporation to handle the latter's products in this territory, with particular emphasis on Cobalt Bombs. He also visited the Westinghouse works at Baltimore and with the New York Manager of Marconi Instruments went on to Washington, where he examined X-ray installations in a model American hospital.

(Continued on page 50).

NEW PRODUCTS: LATEST RELEASES IN ELECTRICAL AND ELECTRONIC EQUIPMENT

This section of our paper is reserved for the introduction of new products and space preference is given to our regular advertisers. For further particulars contact Advertising Manager, R. & E., Box 8022, Wellington.

THE ULTIMATE PRIZE-WINNING 7-VALVE PUSH-PULL A.C.-BATTERY HEAVY DUTY PORTABLE



This new prize-winning Ultimate is the last word in portable design. Already the styling and practicability of cabinet has won the New Zealand 1954 Plastics Institute prize, and dealers all over the Dominion are acclaiming the wonderful performance from the 7-valve push-pull circuit.

The Ultimate "Troubadour", as it is called, is the ideal portable receiver for use on A.C. or battery operation, as it gives a powerful and rich reception even on difficult stations. The Ultimate push-pull portable incorporates the latest in A.C./Battery circuit design, has a built-in loop aerial, long-life batteries (two—482 Eveready, and one 739) and ensures the user of top performance reception in excess of 200 hours.

The Ultimate "Troubadour" incorporates a positive position A.C./Battery switch to eliminate the possibility of battery drain while the set is on A.C. operation.

The "Troubadour" cabinet is in two colours, one rich maroon phenolic plastic, and another in walnut phenolic plastic. The speaker is a 6 in. Rola.

Dimensions: 12 in. x 10½ in. x 6 in. Portability is easy with the weight of only 15¾ lb.

Manufactured by Radio (1936) Ltd., of Quay Street, Auckland.

The Ultimate prize-winning push-pull portable retails at £33 9s.

RECORD TALK

By JOHN GRAY

Westco Distributors Ltd., who took over the handling of Stebing and Zodiac records some time ago, are also local agents for a leading American make, Mercury. Like all the major American companies nowadays, Mercury figures prominently in both popular and classical fields. Westco announce they will introduce the classical line early this year. Meanwhile there is a good range of current hits available by such favourites as Patti Page, Ralph Marterie, Murad's Harmonicats and the sensational new vocal foursomes, the Crew Cuts, whose version of the crazy and catchy tune "Sh-Boom" has been acclaimed as the leading one (M 4046). Mercury's selection of children's records (which is not exactly an overcrowded field) is worthy of attention, too.

Among recent popular discs from Philips, the Rosemary Clooney version of "This Ole House" should prove attractive both to fans of Miss C. and to those who like a good tune and are still intrigued by the background effect of a jangling harpischord, so much favoured on this make of record. The song on the reverse of this disc (B 25411) is called "It just happened to happen to me," says nothing new, but says it in an attractive way. On B 21379 The Mariners are back with a very old favourite which has once again come into prominence—"In the Chapel in the Moonlight." The Beverley Sisters (there are three of them, not two as I unwittingly implied the other month, thus drawing the wrath of an English fan of theirs) are in particularly bright form with "Never Never Land," which shares P 26130 with "Little things mean a lot," a tune that will doubtless be three months out of date by the time these words are printed, but is surely none the worse for that.

Radio Corporation were right off the mark with "This Ole House," their locally recorded version by Pat McMinn (Tanza X 236) hitting the market simultaneously with Rosemary Clooney's. Miss McMinn followed up with two Chistmas ditties on Z 237, one of which was that entertaining piece of nonsense "I want a hippopotamus for Christmas." Stan Freberg's latest local release is "Yulenet," occupying both sides of Capitol CP 341. The tale of Mr. Grudge, who wouldn't believe in Santa Claus, is told in "Dragnet" style and should amuse everyone. Too late for Christmas? Buy it for the children and keep it in cold storage for next time.

The vast Festival catalogue offers an assortment of music, from currently popular torch singers to Beethoven's Missa Solemnis, but nothing has moved me more than their 12 inch LP of negro spirituals as sung by Todd Duncan. (CFR 12-156). Not only does it offer exceptionally good value (there are almost twenty songs included) but consistently beautiful singing and splendid recording, both of Duncan's voice and Carroll Hollister's accompaniment at the piano. This is sincere, honest singing by an artist who surely believes what he is singing about, and one need not be unduly superior to declare roundly that any of these spirituals, as sung by Todd Duncan, is worth all the Tin Pan Alley "religious" effusions put together.

Another singer of sacred songs whose records need embarrass no one is the American gospel singer, George Beverley Shea. H.M.V. have done well to make available four of his most recent titles. "Tenderly He Watches" and "I'd rather have Jesus" are on B 10668, "If you know the Lord" and "The King of all Kings" on B 10669.

For their latest popular release, H.M.V. have resurrected two very catchy sides by that well known vocal group, The Weavers. The titles, on Columbia DO 70122, are "Hard ain't it Hard" and "Run home to Mama." Steve Allen tells the old stories of Cinderella and Goldilocks on DO 70069. Perhaps this is best described by H.M.V. themselves in their disarming announcement "This is not a children's record." Six titles by Jose Iturbi should find a ready sale. He is represented by some Chopin, including the most inevitable of the polonaises (on ED 1261, both sides), and on EC 133 there are pieces intriguingly entitled "Blues" and "Boogie Woogie Etude." Old timers will not be slow to welcome a Peter Dawson favourite, "Dark haired Marie," which reappears under its original number, B 4405. Doubtless they could suggest many other titles long since disappeared, and whose return would be heartily

welcomed. This reminds us that a number of the older favourites have indeed been made available once more, in the new and convenient form of 45 r.p.m. discs. I am not sure that these midget records have really "caught on" here, and frankly I can see no valid argument against them, for people equipped with three speed machines, of course. They won't break, they take up less room than the old style popular disc, and are almost completely free of surface noise. The musical range is wide, all the famous artists and popular entertainers of the H.M.V. group being represented. The more recent Extended Play 45's, giving at least a quarter of an hour's music within the compass of a 7 inch disc, really do offer a bargain at the price.

Another generous pile of LPs comes from the H.M.V. people It is simplest to begin at the top of the four page list, pointing out items of interest as they occur. On ALP 1142 is a grouping of Schumann's "Carnival" and "Etudes Symphoniques" played by Alfred Cortot. Now his previous versions of these pieces were released by H.M.V. around 1930, possibly earlier; so it goes without saying that the new record is, as such, a vast improvement. But time stands still for none of us, least of all for Cortot. It never ceases to intrigue me how some of the world's great pianists preserve their technique to an advanced age. By all recent evidence, Backhaus, at 70, and Rubinstein and Gieseking, around 60, are still at the height of their powers. Alas, this is not true of Cortot, and, as sheer playing, his new performances of these Schumann works show up palely beside the youthful ardour and deadly accuracy of pianists of a younger generation—say Geza Anda, Badura Skoda, and Bela Siki. But, on the other hand, many will be happy to sacrifice a little accuracy for the sake of Cortot's intense feeling for Schumann. The coupling is an attractive and sensible one, and in the Etudes Symphoniques Cortot includes the five posthumous variations which few pianists of the new generation ever bother to play.

With the appearance of ALP 1145, an historic series is completed: Toscanini's renderings of the nine Beethoven symphonies. This last disc contains Nos. 2 and 4, which will endear it to those who like their money's worth, as these symphonies are usually allotted a whole disc apiece. A further bargain is a 10 inch version of Mendelssohn's third symphony, the "Scotch," another in the fine series recorded by Goossens with the ABC Sydney Orchestra (BLP 1045).

Opera is once again to the fore, with one or two welcome rarities. We have long enjoyed the Spanish Dance from Falla's opera "La Vida Breve," and almost the first disc made by Victoria de los Angeles was of two dramatic solos from it. Now the whole opera is available in an authentic performance, recorded in Barcelona by a Spanish cast headed by the incomparable de los Angeles herself (ALP 1150-1). "La Vida Breve"—means "Life is short," and so is the opera, thus only three sides are required. The fourth has been given over to a recital in which the singer, accompanied by Gerald Moore, renders several Spanish songs, and an Italian one by Respighi, as only she can.

The opportunity of sampling some Rossini other than "The Barber" comes with the release of "La Cenerentola" ("Cinderella") by the cast of the recent Glyndebourne production, under the spirited direction of Vittorio Gui. This covers 3 LP discs (ALP 1147-9), but even so the second act has had to be cut. Gounod's "Romeo and Juliet" makes its first appearance in a complete version on Decca LXT 2890-2. It's a work with which to-day's public—outside France and Belgium at least—is regrettably unfamiliar, and if Shakespeare is to be set in the comfortable, old fashioned style of a century ago, then Gounod seems as good a composer as any. Soloists, chorus and orchestra of the Paris Opera, plus an Italian conductor, Alberto Erede, ensure a lively performance. The same can be said of the Columbia "Tales of Hoffman" (33CX 1150-2), the ensemble this time being that of the Opera Comique. This is a great opera, and though the recording is not the richest we have heard, for it originated in a series of 78s made in the late 1940s, it gives a far more authentic account of the work than Decca's version from the film sound track. Though each occupies three discs, the Columbia gives us much more of the music and the performance is extremely alive. Some of the minor singers are quite splendid Fanelly Revoil as Nicklaus, for instance. Raoul Jobin sounds both ardent and frenzied as Hoffman—I have always thought the hero of this opera a quite feverish character. One or two of the leading ladies tend to shrillness, but Renee Doria, as the singing doll, is crystal clear in tone and suitably acurate in her famous aria. There is plenty of "theatre atmosphere" and all in all this is a splendid "Hoffmann," utterly French from start to finish. Surely it will be the unhesitating choice of all who love what the composer called a "fantastic opera."

Two decidely gifted singers of the younger school are each represented by a new Columbia "recital" disc. The Swedish tenor, Nicolai Gedda, delivers himself of no fewer than twelve operatic arias on 33CX 1130. They are from French, Russian, and Italian works, among the less frequently heard being excerpts from "Romeo and Juliet," "Eugen Onegin," "L'Arlesiana," and Auber's "La Muette de Portici," once popular under the name of "Masaniello." The tenor worshippers had better note this release, for young Gedda has more of the required virtues, and fewer of the prevailing faults, than one or two leather-lunged Italian artists who have perpetrated their "recitals" on LP during the last year or so. I must hasten to add that the latter do not include the fine artist Giuseppe di Stefano, who is heard in an irresistible recital of Neopolitan songs on H.M.V. BLP 1052. The other newcomer introduced by Columbia is the exquisite light soprano Mattiwilda Dobbs, already known as an opera singer (she starred in Nixa's splendid set of "The Pearl Fishers"), but now venturing into the realms of art song and lieder with the assistance of the indispensable Gerald Moore. On 33CX 1154 she goes one better than Gedda and actually includes seventeen different numbers: this is LP with a vengeance. The programme ranges through Schubert Brahms and Wolf to Faure, Hahn and Chausson. There are old favourties like Hahn's "If my songs were only winged" and Schubert's "Hedgeroce" to offset the less familiar ones. In the early days of LP some of us shook our heads over these "recital discs," which seem wrong in principle and could lead to enormous expenditure in order to obtain one or two numbers really wanted, but as they have never ceased to appear it is obvious that there is a large public for them. No one need be disappointed in those mentioned above.

Mention of other interesting LPs, including several from Brunswick, Decca and Oiseau Lyre, must be deferred until next month.

MISSING AND STOLEN RADIOS

AUCKLAND:
Kriesler, A.C./battery portable, model 212, serial No. 4619; red plastic case 18 in. x 12 in. x 9 in., white plastic handle, dual type dial readable from either side of set, travelling needle type indicator.

HAMILTON:
Wayfarer 6 volt auto radio, bronze cabinet, grey dial, volume control and speaker in one compete unit.

TAURANGA:
Wayfarer 6 volt 5 valve auto radio, serial No.2536; brown bakelite case with grey round controls, one complete unit.

WHAKATANE:
H.M.V. 8 valve auto radio, serial No. 39408; black cabinet with white dial, push button.

PAHIATUA:
Ultimate 5 valve mantel model, chassis No. 142739; off-white similar to current model, greasy marks round dial knobs, brown plastic lead with brown three point plug.

WELLINGTON:
Zenith model H500, super trans-oceanic portable 5 valve battery/electric radio receiver, chassis No. 5H40; cabinet 22 in. x 10 in. x 12 in. with light plastic oblong dial, sliding panel and radio mast adjustable at back of set.

Colombus broadcast receiver, serial No. 22150; wooden cabinet 30 in. x 12 in. x 12 in., 7 years old.

Philips bedside radio, type 146, serial No. 325343; maroon and cream plastic cabinet.

H.M.V. auto radio, serial No. 20214; standard model.

AUCKLAND:
Skymaster, 5 valve broadcast Colt radio, serial No. 339; dark brown plastic case with plastic bars across speaker.

HAMILTON:
Prior A.C. Radio; dark blue plastic case 12 in. x 10 in. x 5 in., rectangular speaker grille with sliding dial below, control knob each end.

ROTORUA:
Pye A.C./D.C. battery portable, serial No. 33008; maroon bakelite case with carrying handle on top.

TE AROHA:
Philco 6-valve battery/electric portable 230 volt radio, serial No. 54687; white plastic case 13 in. x 5 in. x 9 in. with white plastic handle; Eveready batteries.

Pye Chairman's Visit

Mr. C. O. STANLEY IN NEW ZEALAND

Mr. C. O. Stanley, C.B.E., Chairman of Pye Ltd., England, paid a brief visit to New Zealand last month in the course of a world tour. Mr. Stanley is the driving force behind the Pye Group of Companies and an outstanding personality in the radio industry in the British Empire. Apart from his wide business interests, Mr. Stanley is a keen trout and salmon fisherman, an expert yachtsman and a leading and

Mr. C. O. Stanley and Mr. G. A. Wooller.

successful breeder of Aryshire Cattle. During his short visit to Auckland, where he was met and entertained by Mr. G. A. Wooller, Mr. T. J. Spencer, and Mr. D. M. Cooper, of Pye (New Zealand) Limited, Mr. Stanley was able to mix some very full days of business discussion with a taste of New Zealand's fishing opportunities.

"The continued growth of the Pye Group of Companies is a source of constant wonder to me," said Mr. Stanley. "Back in 1896 when Mr. W. G. Pye started his business of manufacturing scientific instruments and laboratory apparatus in Cambridge the business was small indeed. Nowadays Pye Company activities are so widespread that it is quite a trip for me to get around the world and visit all the offices and affiliations. As you probably know, I am a great believer in the strength of private enterprise and over the years it has been my task to represent these views quite forcibly to governments of varying political colours. One very clear picture I have formed in the course of my present trip is that the initiative of the individual units which make up the Pye Group supplies the momentum which is carrying the group forward year by year. The operations of the New Zealand Company. Pye (New Zealand) Ltd., in the few short years since its establishment, have given me a great deal of satisfaction because the results have been achieved not so much by our efforts in Britain as by the efforts of a team of very versatile, enthusiastic and efficient New Zealanders who have co-operated so splendidly with the whole group. Radio, television, the whole electronic industry, are really infants yet and the future holds so many opportunities for all branches that it is impossible to forecast developments even a few years ahead. But I am sure that the qualities of originality, adaptability and ingenuity that have fired New Zealanders in so many walks of life will find many outlets in the industries with which we are concerned. I am only sorry that I am not able to stay longer in your country and to see more of a place that has always fascinated me."

P.B.A.

Pye (N.Z.) Ltd. Expansion

SPECIAL PRODUCTS DIVISION

The formation of a Special Products Division of Pye (New Zealand) Limited was announced recently by Mr. G. A. Wooller, Managing Director. This division has been formed to deal with the growing demand in New Zealand for the specialized equipment of Pye Group Companies in the United Kingdom. In charge of the division is Mr. Frank Marker, an associate member of the Institute of Practical Radio Engineers, England, who recently returned from England where he has spent several years with Pye Ltd. Prior to going overseas, Mr. Marker represented the manufacturers of Eveready Batteries in New Zealand and was later with Pan American World Airways in Auckland. With Pye Ltd. in Cambridge, England, he made a particular study of the manufacture and application of Pye Specialized Equipment manufactured by W. G. Pye and Co. Ltd., Pamphonic Reproducers Ltd., W. Bryan Savage Ltd., and Radio Frequency Heating Division of Pye Ltd. Included in this range are Scientific Instruments, Radio Frequency Heating Equipment, Delayed Sound Reinforcement Equipment, Line Source Loud-Speakers, High Fidelity Reproducing Equipment, and Very Low Frequency and Low Radio Frequency Kilowatt Amplifiers for vibration and fatigue testing and as a variable frequency power source.

A representative stock of scientific instruments is on display at the Auckland showrooms of Pye (N.Z.) Ltd., on the 4th floor, Imperial Buildings, Queen Street. In addition, Mr. Marker has a comprehensive library of catalogues and technical data and is well able to supply information on request.

HOW TO SELL DOMESTIC APPLIANCES

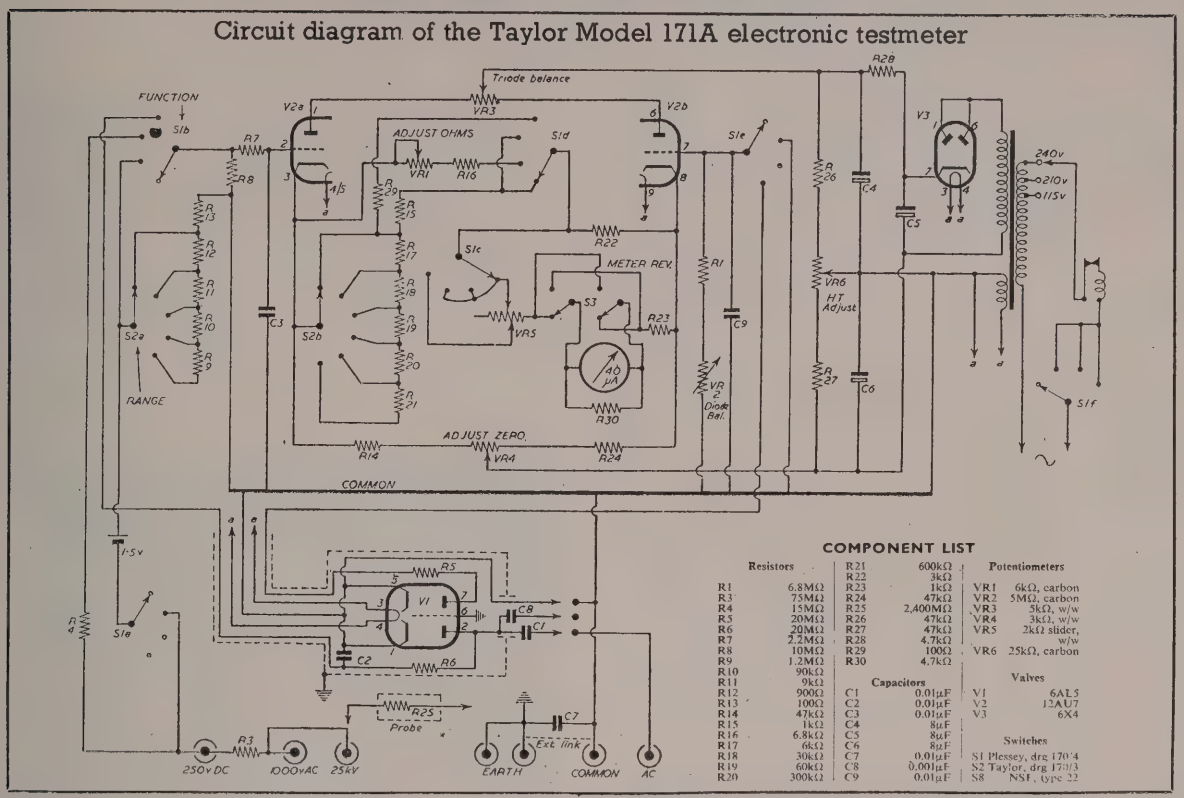
Intended to be complimentary to the syllabus covering the Company's sales training courses, the English Electric Co. Ltd.'s new publication "How to Sell English Electric Domestic Appliances" provides a complete instruction course in salesmanship for these products. It records the selling features of the whole range of English Electric domestic appliances, serves as a general reference book for periodic revision of product knowledge, and contains many ideas for the effective development and improvement of sales technique.

Following an introduction giving a basic guide to selling generally, are detailed illustrations of the individual appliances and many amusing drawings emphasizing good sales approach and salesmanship. In each of six sections, talking points on the performance and construction of the appliances are set out, together with suggestions for meeting possible objections posed by the customer. So that the salesman may tell his story briefly and attractively, a "TWO-minute Presentation" using the salient features of each appliance is given as a guide. Finally, each section has a quiz against which to test product knowledge.

Of attractive appearance, this 64 page manual is written in a readable and humorous style, and lavishly illustrated with cartoons.

FOR THE TECHNICIAN

Circuit diagram of the Taylor Model 171A electronic testmeter



COMPONENT LIST

	Resistors			Potentiometers	
R1	6.8MΩ	R21	600kΩ		
R3	75MΩ	R22	3kΩ		
R4	15MΩ	R23	1kΩ	VR1	6kΩ, carbon
R5	20MΩ	R24	47kΩ	VR2	5MΩ, carbon
R6	20MΩ	R25	2,400MΩ	VR3	3kΩ, w/w
R7	2.2MΩ	R26	47kΩ	VR4	3kΩ, w/w
R8	10MΩ	R27	47kΩ	VR5	2kΩ slider, w/w
R9	1.2MΩ	R28	4.7kΩ		
R10	90kΩ	R29	100Ω	VR6	25kΩ, carbon
R11	9kΩ	R30	4.7kΩ		
R12	900Ω			Valves	
R13	100Ω	Capacitors			
R14	47kΩ	C1	0.01μF	V1	6AL5
R15	1kΩ	C2	0.01μF	V2	12AU7
R16	6.8kΩ	C3	0.01μF	V3	6X4
R17	6kΩ	C4	8μF		
R18	30kΩ	C5	8μF	Switches	
R19	60kΩ	C6	8μF		
R20	300kΩ	C7	0.01μF	S1	Plessey, drg 17074
		C8	0.001μF	S2	Taylor, drg 17013
		C9	0.01μF	S8	NSF, type 22

Maintenance Instructions on Taylor Model 171A Electronic Testmeter

(Reproduced with acknowledgement to "British Radio and Television" and through the courtesy of Messrs. A. R. Harris and Company Limited, Christchurch, New Zealand Agents for Taylor Electronic Instruments.)

The basis of the instrument is a 12AU7 twin-triode, around which is built a self-balancing bridge network, controlling a microammeter. Also provided is an H.F. probe unit incorporating a 6AL5 twin-diode, the unit being compensated against drift. A 25kV probe unit is available as an extra feature. The R.F. probe unit enables close connections to be made to the test circuit and has a frequency response extending up the U.H.F. region.

The out-of-balance component appearing across the bridge network is indicated on a 50 μA meter which is provided with a 5 in. mirror scale and knife-edge pointer for accurate reading. By careful choice of operating potentials, the use of cathode feedback and the inherent balance of the circuit, supply voltage variations have a negligible effect on reading accuracy and zero setting.

The internal power supply employs a strapped-anode 6X4 operating as a half-wave rectifier. The instrument is designed to operate from 105–125 volts or 200–250 volts, 40/100 cycles; the adjustment panel is fitted internally and adjusted at the factory to 240 volts. Each instrument is fitted with an automatic cut-out fuse connected in series with the primary of the power transformer.

NOTES ON MAINTENANCE

Battery

When the "Zero Ohms" adjustment can no longer be set correctly, the battery should be replaced. To gain access to the battery, unscrew the small paxolin cover plate on front panel and withdraw the spent cell, replacing it with a new one of correct type—such as Ever Ready U11, American Ever Ready 935, Burgess type 1, or equivalent. The new cell should be inserted cap first after, removing the paper tube.

Valves

Owing to the low emission conditions under which the valves operate, replacements are not likely for a considerable time. Each instrument has been thoroughly soak-tested before transit to ensure reliable operation. This process also "ages" the valves and associated components, resulting in reliable and consistent performance. It is recommended that when replacements are necessary, the valve(s) should be

aged before insertion, either by continuous running for 24 hours in the instrument or by operating them under full load conditions for at least 12 hours.

The duo-diode in the H.F. probe unit may need replacement if the zero adjustment is normal on D.C. voltage range but varies considerably on switching to the A.C. voltage ranges, or if no readings are obtainable on the A.C. voltage ranges. The twin-triode in the instrument may need replacement if it becomes impossible to adjust the zero setting on the D.C. voltage ranges. Failure of the rectifier valve will be self-evident.

Calibration

It is advisable to check calibration after making valve replacements (due to valve manufacturers' tolerances) to ensure high accuracy standards.

The 6X4

After changing the rectifier valve, check the voltage between the H.T. positive and common rails. This should be within 205-215 volts but if it is outside these limits, adjustments should be made by varying the potentiometer VR6, which is located near the top of the amplifier chassis.

The 6AL5

After changing the diode in the R.F. probe, it may be necessary to adjust VR2, which serves to balance the standing current in the two diode sections. This should be set so that zero meter setting point on VR4 is brought well within the range of this control —it is marked "Adjust Zero" on the front panel. The potentiometer VR2 is located on the amplifier chassis at the end nearer to the bottom of the instrument.

When the meter can be zeroed correctly, the function switch should be set to the "V.a.c." position and the range selector switch to the 10 volts position. The meter can then be checked at full-scale deflection by applying 10 volts R.M.S., 50 c/sec., of good sine waveform, to the A.C. socket on the front panel. During this test, the R.F. probe unit should be plugged into the housing.

If any adjustment is indicated as necessary, the meter should be set exactly to the full scale mark by moving the "A.C." clip contact on the Taylor wire-wound slider rod, which is mounted on the amplifier chassis. The contact normally required is that nearer to the top of the instrument.

It is recommended that the applied A.C. test voltage should be monitored by a sub-standard meter having an accuracy of within ±0.5 per cent., so that the adjustment will then automatically bring all the A.C. voltage ranges within the specified tolerances.

The 12AU7

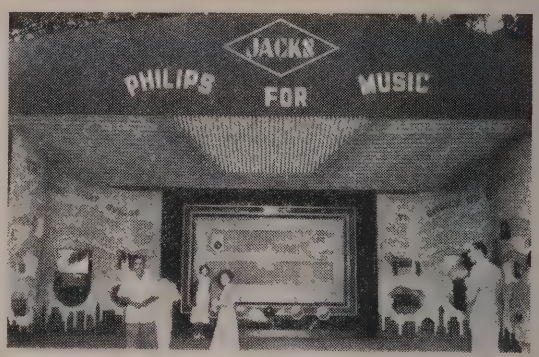
In replacements involving the twin-triode amplifier valve, a check should be made on the voltage across C4, to ensure it is within 205-215 volts, and then the calibration checked on both A.C. and D.C. The A.C. check may be conducted as described for the 6AL5 and the D.C. check in a similar manner but using the 10-volt D.C. range using a sub-standard D.C. voltmeter to monitor the test voltage. Adjustments on the D.C. voltage ranges may be carried out by variation of the lower clip contact on the wire-wound slider rod.

After replacement, the "Adjust Zero" control should be checked to ensure that this zeros the meter near the centre of travel of the control. This point may be adjusted by VR3, located near the top of the amplifier chassis.

Special Note

Care must be taken to ensure that the meter mechanical zero-set is correctly adjusted where very accurate measurements are required. This can be checked while the instrument is operating by first ensuring that no external test voltage is being applied, switching to the 1 volt range and then checking the electrical zero-set by alternately switching over the "Meter Reverse" control and adjusting the "Zero Adjust" control until no movement of the meter pointer takes place. Should this position not correspond with the zero scale calibration, it should be adjusted by means of the mechanical zero-setting pip on the front panel.

PHILIPS SUCCESS AT THE SINGAPORE TRADE FAIR



This giant loudspeaker gave out the latest tunes at the recent Singapore Trade Fair. The Philips Exhibit won first prize as the best stand.

NEWS FROM GOVERNMENT DEPARTMENTS

Post Office:

Chile has now been added to the list of countries to which New Zealand can speak by radio-telephone. The service is via the United States of America, and at the rate of £1 10s. 0d. per minute, the minimum time for a call being three minutes.

* * *

Some idea of the intricacy of a modern telephone exchange may be gained from the fact that 15,000 separate components—many of them extremely sensitive pieces of equipment—go to its making and that of the system radiating from it.

* * *

The Post Office holds a special library of postal and telecommunications films of particular interest to social studies classes. These films are available on request to any educational or cultural organization wishing to borrow them. Of special interest to business people is the film "Telephone Courtesy." This has been shown already to many thousands of New Zealand business groups, who, after seeing it, have realized the value of telephone courtesy in business.

LATEST OVERSEAS DEVELOPMENTS

PLESSEY "CASTANET" TANTALUM ELECTROLYTIC CAPACITORS

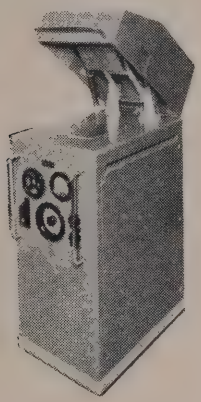
Plessey "Castanet" Tantalum Electrolytic Capacitors. Complete assemblies and component parts.

The Plessey Company Limited has just introduced a new range of tantalum electrolytic capacitors which combine a high capacitance of 55 *uf.* with exceptionally small size, the diameter being only 22 mm. and the depth 6 mm. The working voltage is 70 volts D.C. over a temperature range of —60°C. to +150°C., applied, the peak ripple rating being 80 volts and the surge rating in addition to which a ripple voltage of 10 per cent. may be the peak ripple rating being 80 volts and the surge rating 100 volts. Other notable features include an exceptionally low leakage current, which is only 1 microamp at normal temperatures, and an almost indefinite shelf life.

Single units can be supplied with a soldering tag and mounting stud. Alternatively, a number of capacitors can be stacked in series or parallel to provide higher working voltage or different capacitance.

* * * *

NEW REDIFON "HANDY HEATER" WILL SPEED GLUING



An astonishingly rapid and convenient way of gluing together small components without recourse to jigging is provided by a new dielectric hand applicator—the Redifon DA.1.

Now in full production for the woodworking and allied industries, this remarkable "handy heater" derives its power through a special 18 feet long co-axial cable from a trolley-mounted generator.

Its introduction will mean that manufacturers can now raise their output and lower their costs by having "on tap" R.F. power which can be taken to the work instead of having to offer up the work to the generator— as is often the case with conventional R.F. installations employing work stations and shuttle-type loading arrangements.

Measuring 9½ inches long, by 11 inches high, the DA.1 weights just under 6 lb. Its appearance has been likened to that of a futuristic flat iron.

The standard electrodes fitted to its base measure 4 in. by ¾ in. These are 3¼ in. apart and will be found suitable for most applications, although, for special work other electrodes can be quickly and easily substituted.

Among the very large variety of jobs where quicker, cheaper and better results can be obtained by using the DA.1 are bonding—in a matter of seconds—fancy mouldings to panels in the manufacture of furniture; tacking veneers to plywood before pressing, patching ply, and other processes where synthetic resins are employed with dielectric materials.

The generator is controlled by a trigger switch conveniently sited in the handle of the applicator. The power output—450 watts at 35 Mc/s per second supplied by a Redifon RH.30—is regulated by a control situated in the end of the applicator. A built-in neon lamp indicates "RF power on."

* * * *

PROMINENT U.S. MANUFACTURERS APPOINT AD. AURIEMA, INC. EXPORT REPRESENTATIVE

The firm of Ad. Auriema, Inc., New York, has been appointed exclusive export representative by the following manufacturers:

SARKES-TARZIAN, Inc., Bloomington, Indiana, foremost manufacturer in the U.S. of all types of selenium rectifiers.

SENSITIVE RESEARCH INSTRUMENT CORPORATION, Mount Vernon, New York, developers and manufacturers of very sensitive electrical measuring instruments.

THE PHAOSTRON COMPANY, South Pasadena, California, pioneer in designing and manufacturing environment-free aircraft instruments, aircraft control gear, meters, and relays.

The Auriema organization, engaged since 1921 in exporting electronic, electrical, and refrigeration equipment, has agents throughout Latin America, Europe, Africa, Australia, New Zealand, and the Far East. Inquiries concerning the products of the Sarkes-Tarzian Inc., Sensitive Research Instrument Corporation, and The Phaostron Company, may be addressed to any Auriema agent, or the firm's headquarters at 89 Broad Street, New York 4, N.Y.

* * * *

NOISE METER FOR NOISE, VIBRATION MEASUREMENTS

Compensable hearing loss, lower efficiency and morale, and increased accident susceptibility are some effects of unchecked noise and vibration.

A sound level meter for measuring noise intensity is basic for even simple noise studies. For significant readings, this instrument should meet all specifications of the American Standards Association as does the H. H. Scott Model 410 B Sound Level meter. The most rugged and compact noise meter obtainable, the 410 B is exceptionally convenient for even non-technical users.

Additional equipment in the Scott Sound analysis line include the Model 420 A Sound Analyzer, Vibration Pickup and Integrator, Mounting Tripod, Leather Carrying Case for the 410 B, etc. Complete information may be obtained by writing directly to Rocke International Corporation, Export Department for Herman Hosmen Scott, Inc., 13 East 40th Street, New York 16, N.Y., U.S.A.

CIRCLING THE GLOBE

THE HAPPY ORCHARDIST

From America comes the news of a new defence with which orchardists are experimenting in their never-ending battle against frost. A vertical-shaft propeller-type fan, on a tower, moves a larger volume of air downward against deflectors which drive it in all directions over the treetops. A 25 h.p., 1,180 r.p.m. vertical motor mounted on a steel tower drives the propeller directly through a shaft extension at the top. One such "breeze-maker" is estimated to protect about five acres against light frost.

* * * *

SUPER WASHING MACHINE

News from Hungary tells of the production there of a "full service" domestic laundry machine which takes 17½ pounds of clothes which it washes, dries and IRONS in 75 minutes.

This super servant heats its own water—15 gallons— and the washing is done in a rotating drum in 30 minutes. Next, water is removed from the clothing by centrifugal action in 15 minutes, and in another 15 minutes the clothing is dried and ready for ironing. The latter is completed in 15 minutes by the electric ironing mechanism.

* * * *

MULTI REFLECTOR FIRE

In Brtish trade notes we find news of a new multi-reflector fire, which, mounted on castors and standing 17½ in. high, can be used as a coffee or occasional table, or a warm plate. Finished in a variety of colours including cream, ivory, fawn, etc., and provided with a 9 ft. 3-core cable for operation on 200-250v. A.C./D.C. mains, this space heater is designed for positioning in the centre of a room. It incorporates two 1 kw. elements, one of which can be switched off when desired, and the reflectors are placed so as to give eight "fires." Heat distribution is controlled within a certan range by an air flow regulator.

* * * *

EYES FOR THE FIGHTERS

Alas, man's determination to annihilate his fellow man never slackens in intensity. One of the latest efforts is the art of directing projectiles so that they and a target occupy the same position in space simultaneously. The combination search, fire control and tail warning radar in the night-fighter, is typical of such equipment. This aircraft carries a radar four times more powerful than its predecessor, searches for the target and follows until the objective is relatively close. Then a second radar unit is energised and tracks the target automatically giving the pilot computed direction and distance to the enemy aircraft. The pilot takes comfort from the knowledge that while he is following one target, all sides are watched by radar. It's good to know what's behind—or is it?

* * * *

GRUNDIG "GHOST HUNT"

Newest film star is the Grundig Tape Recorder featured in a new Pathe Pictorial film entitled "Ghost Hunt." Not content with this, Grundig has also appeared in a recent British TV play. "Operation North Star."

* * * *

NEW AUCTIONEERING SYSTEM

Wholesale fruit buyers scattered across the eastern half of the United States competed at auction from thousand-mile distances when a new electronic communications circuit called "Selevision" was given its first working trials recently.

The system linking ten American cities from Lakeland, Florida, to Boston and Chicago, changes almost nothing in the time-honoured practices of auction sales. Rather, it uses electronic devices to span space and enable Philadelphia wholesalers to bid against fellow wholesalers in Detroit instantaneously on carloads of fruit still in Florida.

When the national auction is ready to start, bells ring in the auction rooms in different cities, and the number of the first carload or lot to be auctioned is flashed simultaneously on screens in the ten rooms.

A bid made in any one of the cities appears instantaneously in all ten. Then a large clock dubbed the automatic auctioneer begins to tick off the seconds until a higher bid is made and again flashed on the screens. When ten seconds elapse without a higher bid, a bell rings, the screens record "sold," and the next lot is put up for auction.

The fruit offered for sale is certified by the U.S. Department of Agriculture as to brand, quality and quantity. Descriptions of each carload are furnished to accredited buyers in each district Selevision room in advance of the auction day. The descriptive data is carried over Selevision's private wires to the salesrooms and prepared by special duplicating equipment.

With a definite sale to a definite buyer at a definite price, the auctioned lot is shipped directly to the final customer's city, eliminating charges for rerouting and demurrage and speeding delivery of perishables.

* * * *

BRIT. I.R.E. PRESIDENT FOR 1954-55

Rear-Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O., is President-elect

The Council of the British Institution of Radio Engineers announces that Rear-Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O., is to be the next President of the Institution.

Educated at the Royal Naval Colleges, Osborne and Dartmouth, Rear-Admiral Sir Philip Clarke commenced regular service in 1914. After the first world war, and further study at Christ's College, Cambridge University, Admiral Clarke served overseas as Torpedo Officer, and, on appointment as Commander in 1932, joined the staff of the Tactical School. Following appointments with the Home Fleet and the South American Squadron he was promoted to captain on 31st December, 1938.

As Commodore and Senior Naval Officer, Red Sea and Aden, he was mentioned in despatches and in 1941 was appointed Deputy Director and subsequently Director of the Anti-Submarine Warfare Division.

From 1943 to 1946, Admiral Clarke was in command of H.M.S. Glasgow, being awarded the Distinguished Service Order on the 28th December, 1943. He was again mentioned in despatches for his work in the Normandy landings.

Whilst Director of Manning at the Admiralty, he was promoted to Rear-Admiral, subsequently serving on the Eastham Manpower Committee and then as Admiral Superintendent, Malta. He was appointed to his present post of Director of the Naval Electrical Department in 1951.

Admiral Clarke was appointed a Companion of the Most Honourable Order of the Bath in 1949 and appointed a Knight Commander of the Most Excellent Order of the British Empire in the 1954 New Year Honours List.

He has been a Vice-President of the Institution since 1952.

* * * *

SYMBOLS FOR ELECTRONIC TUBES AND VALVES

Obtainable from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1., is a useful publication entitled "Supplement No. 3 to B.S. 530 (1948)—Graphical Symbols for Telecommunication." This new supplement gives graphical symbols for (a) various electronic tubes and gas switches used particularly in radar technique, and (b) gas-filled cold-cathods discharge tubes. The graphical symbols for the latter tubes are based on current British and American practice. Slight amendments to the existing symbols in B.S. 530 to meet new developments are also included in this supplement.

* * * *

SALES AIDS FOR "HOOVER"

For sales training and as special aids, many British firms are now producing films concerning their organisations and products.

Well to the fore in this respect is Hoover Ltd., which at present is circulating five 16 mm. sound films. Designed for showing to audiences in many different countries, commentary rather than dialogue has been employed in all except "Smooth-

ing Things Over," which was made initially in a 35 mm. version for distribution to cinemas.

In technicolour, the 31 minute film "All the World Over" takes viewers behind the scenes at the company's head office and factory, demonstrating how the new features of the latest Hoover cleaner are produced from the planning stage. Thus sales organization both in Britain and overseas are kept abreast of developments of which information could be obtained otherwise only by a visit to the factory.

With Cicely Courtnedge in the lead, the two-minute colour film "Smoothing Things Over" employs an entertainment technique to emphasize the features of the new stem-or-dry iron.

Primarily designed to sell the Hoover cleaner, "It's About Time" in its 22 minutes of running, describes aspects of the lives of a typical suburban couple which viewers could easily accept as their own. This film is intended for use only by dealers when interesting potential customers.

Suitable for showing to Women's Institutes, Domestic Science Colleges, Trade and Technical Associations as well as to dealers and the public generally is the 19-minute "Consider the Carpet," which tells the history of carpets, their manufacture, the various dirts that get into them and the different ways of removing these dirts.

This time demonstrating the Hoover Washing Machine, the 20-minute "Time Off My Hands" is another direct selling film using the entertainment technique.

"MELODY BAR"

Planned to augment the existing record department besides enabling customers to browse round, select their discs, and play them over without taking up the time of a large staff, a new "MELODY BAR" has been established recently by a London store, Imhof's (Retail) Ltd. of New Oxford Street. Here over 1,000 records of all makes, and including LPs, are displayed on special rack and wall fittings and grouped according to type.

After collecting the records he wishes to hear, the customer takes them to one of twenty specially designed record "demonstrators," which consist of record players, with amplifiers, feeding small loudspeakers. The latter are mounted inside a "hood" lined with sound-absorbing material. The customer sitting with his head within the "hood" can hear the music clearly while no sound can be detected outside the hood. The sound absorbent cover on the playing desk prevents needle hiss from being heard within the hood. Volume and tone controls are pre-set, and the customer merely has to start and stop the motor. No headphones or ear-pieces are necessary, and each "demonstrator" is a self-contained unit which may be moved to any convenient position.

After choosing his records, the customer takes them to the cash desk, where they are packed, and the sale is transacted.

* * * *

NEW H/F PRE-HEATER

Will plasticize at least 1lb. of preforms per minute

Production of a new 1½ kW high frequency plastic preheater, which will plasticize at least 1lb. of general purpose moulding power preforms per minute, has been announced by Redifon Ltd. This company has been designing and building high frequency heating equipment since 1944 and it is claimed that this new model, the RH.32, is the result of ten year's experience in serving the needs of the Plastics industry.

The RH.32 has a new integral heating chamber giving completely open access to the flush mounted electrode so that loading, clearing and cleaning are speeded up. Construction is robust and the components have been chosen for their absolute reliability. The oscillator valve is a well tried type with an excellent life record and the filters are of generous area and easily cleaned.

N.Z.P.O. Progress

(Continued from page 35).

for the New Zealand Press Association in the direction Sydney-Wellington (five-unit F.S.K.).

During the period, a development of considerable importance was the establishment and expansion of central radiotelegraph facilities in the General Post Office, Wellington, enabling operators at that location to work the various Pacific Islands and overseas terminals from a central office.

(c) Radio Facsimile

In 1947, the approaching demand for transmission of pictures by radio led to the establishment of a phototelegram service with Australia and the United Kingdom. This was extended to include the United States in 1948. The equipment was reinforced with an additional installation in 1951, and the tremendous number of radio photographs exchanged during the recent tour of Her Majesty the Queen will give an indication of the value of such services.

At present the service is operated to the U.S.A. on one channel of an I.S.B. transmitter, while the other channel carries the radiotelephone circuit.

The service to Australia is from Wellington to Melbourne, and pictures for London are sent via Melbourne, the direct service not having been used as yet for this purpose.

(d) General

Developments in mind are the establishment of radiotelegraph and telephone circuits to Vancouver and Fiji as well as other points requiring attention. There is also the need to improve existing circuits both by way of aerial and equipment performance improvements. On radio telegraphy, the institution of special types of radiotelegraph codes designed for error indication, and in some cases error correction, are in mind. Similarly, channelling by the simultaneous use of frequency and time division systems is contemplated. The field is very extensive.

(To be continued).

Trade Winds

(Continued from page 41).

Winging his way homeward across the United States, Mr. Pernase made a brief halt at Hollywood to visit the R.C.A.'s. TV studios, then on to Honolulu and so to Sydney.

In Australia the A.W.A. Works are humming with activity in design and development of TV broadcasting and receiving equipment, which will ensure that the Australian public will be able to procure equipment incorporating the best in overseas electronic techniques.

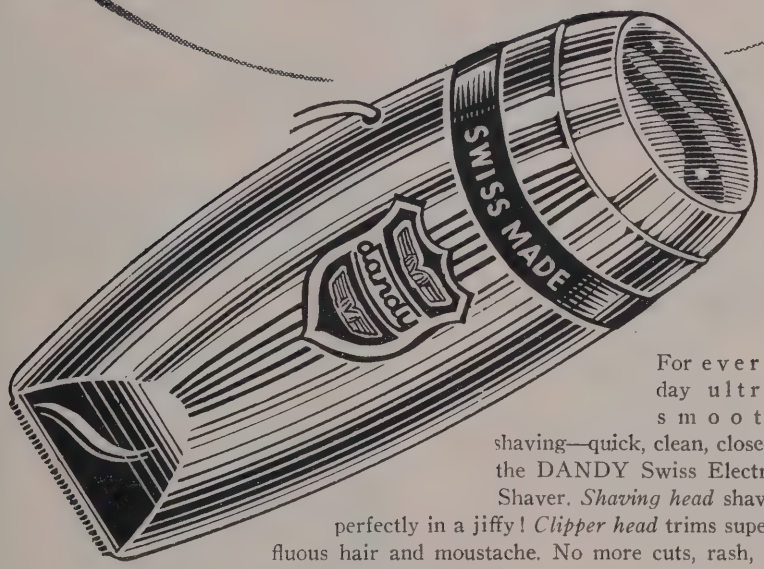
Travel worn but stimulated by these overseas experiences, Mr. Pernase arrived home in time to act as Santa Claus to his welcoming family!

A `DANDY'

Electric Shaver

FROM SWITZERLAND

For superior shaving ease and comfort!



For every-day ultra-smooth shaving—quick, clean, close—the DANDY Swiss Electric Shaver. *Shaving head* shaves perfectly in a jiffy! *Clipper head* trims superfluous hair and moustache. No more cuts, rash, or tender skin with DANDY.

UNEQUALLED VALUE

£7-17-6

The DANDY shaving head cuts whiskers clean and close.

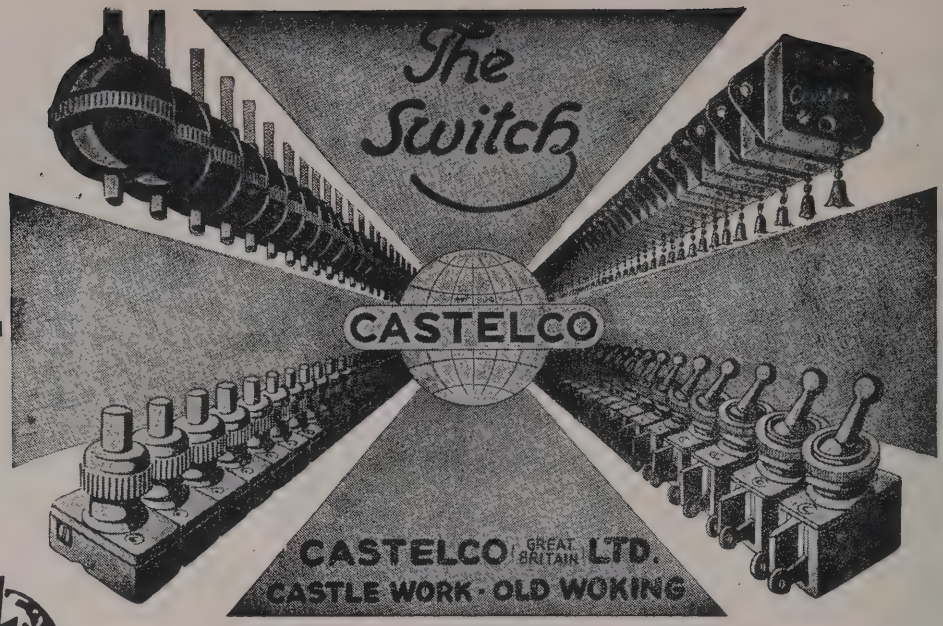
The DANDY clipper head trims moustache and hair of any length.

12 MONTHS' GUARANTEE

dandy

The Superior Swiss Shaver

N.Z. Distributors: Russell Import Co. Ltd., P.O. Box 102, Wellington.



New Zealand Agents:

E.M.I. SUPPLIERS

(Trade Division of H.M.V. (N.Z.) Ltd.)

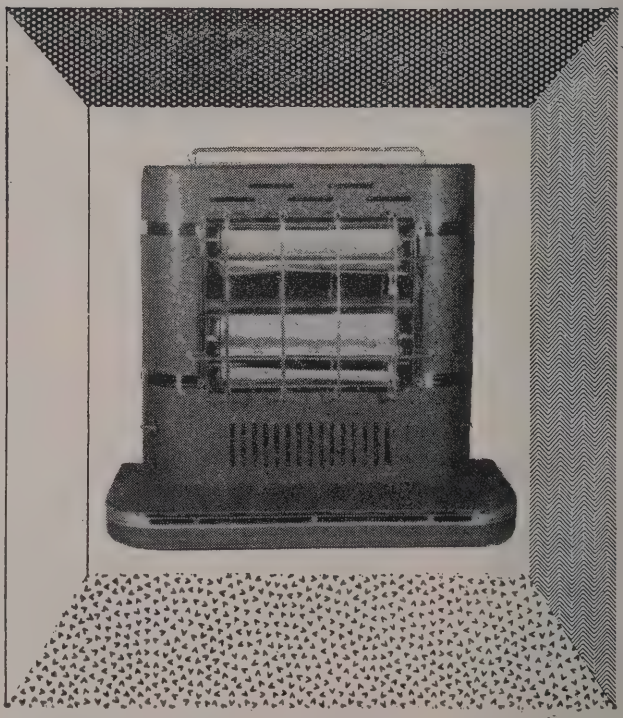
162-172 WAKEFIELD STREET, WELLINGTON C.P.O. Box 296 Phone 54-890

EDINBURGH

Electric Radiator

ANOTHER PANAMA PRODUCT

- ★ Two 10-inch bars
- ★ Individual Switching
- ★ Red Glow Visible at Base
- ★ Louvres for Heat Dissipation
- ★ Crackle Finish
- ★ Chromium Trimmings
- ★ Easily Portable



Available from

CORY-WRIGHT and SALMON LTD.

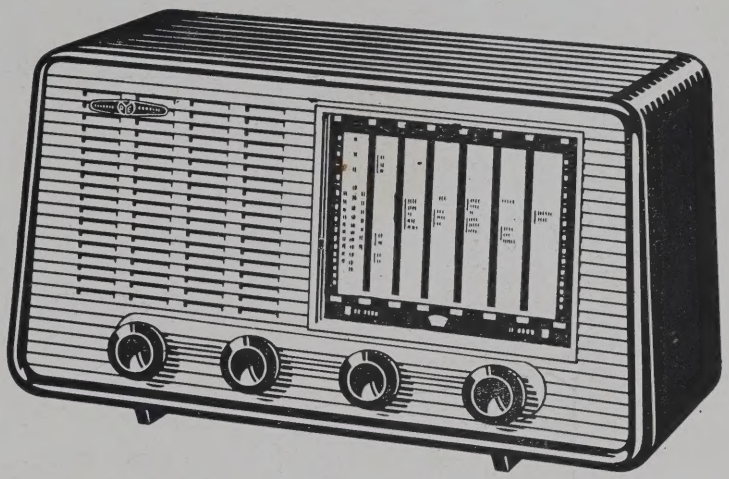
AUCKLAND WELLINGTON
CHRISTCHURCH DUNEDIN

For Better Looks & Better Listening ...

ROUND THE WORLD WITH THE MODEL "G"

The Pye GP239 is a radio that has everything—the amazing range of full bandspreading, superb performance, perfect true-to-life tone, real power and a two-toned moulded cabinet that delights the eye!

£32/15/0

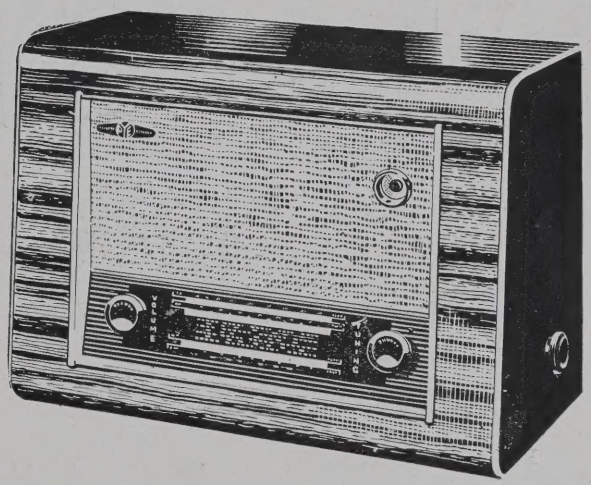


In the famous PYE Tradition

PYE PERFECTION IN THE "71"

Short-wave BANDSPREADING and a "magic-eye" (for easier, better tuning on short-wave or Broadcast bands); a cabinet of gleaming, rich mahogany; five valves for superb reproduction. These are a few of the features of the outstanding "71"—another Pye contribution to better listening.

£29/17/6



PYE

Radio and Television

Look for the distinctive Pye trademark at better Radio dealers everywhere, or for the name of your nearest Pye agent, write to: Pye (New Zealand) Limited, P.O. Box 2839, Auckland

We are Sole New Zealand Agents For—

'SCOTCH BOY'

Magnetic Recording TAPE

ANOTHER 3M COMPANY PRODUCT

"Scotchboy" perfected dry lubrication does away with blocking and sticking, with wow and flutter. Strong and non-kinking, plastic-backed "Scotchboy" runs smoothly and gives perfect reproduction at all tape speeds.

MAGNETIC DATA:

Coercivity . . . . 240-260 Oersteds
Total Remanent Flux. 0.4/0.5 lines ¼ in. width
Uniformity throughout a reel . . . 0.5 d.b.

PLAYING TIMES (per track):

Reels	Spool size	3¾ in./sec.	7½ in./sec.	15 in./sec.
3280 ft.	11½ in.	160 min.	80 min.	40 min.
3000 ft.	11½ in.	150 min.	75 min.	37½ min.
2400 ft.	10½ in.	120 min.	60 min.	30 min.
2250 ft.	9 5/16 in.	110 min.	55 min.	27 min.
1200 ft.	7 in.	60 min.	30 min.	15 min.
600 ft.	5 in.	30 min.	15 min.	7½ min.
300 ft.	3⅝ in.	15 min.	7½ min.	3¾ min.

FREQUENCY RANGE:

50 c/s. to 10 kc/s. at a playing speed of 7½ in./sec.

"Scotchboy's" extra sensitivity and ouptut means you can record either at lower levels for the same output with lower distortion or at the same level for increased undistorted output. Signal/Noise ratio is improved as well.

Manufactured by

MINNESOTA MINING AND MANUFACTURING COMPANY LTD.

167 Strand, London and Slough

TURNBULL and JONES LTD.

Auckland Wellington Christchurch Dunedin Hamilton Palmerston North Invercargill